

FINAL AQUATIC BIOTA STUDY REPORT

Remedial Investigation and Remedial Action Selection Term Contract Number A-47449















Submitted to:



















STATE OF NEW JERSEY

Department of Environmental Protection

401 East State Street,
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Submitted by:



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EXECUTIVE SUMMARY

In order to assess the potential biological impacts of lead and PCB contamination in sediment and soil resulting from previous activities at the Matteo Iron and Metals site (Site), The Louis Berger Group, Inc. (Berger) conducted studies of the aquatic habitats and biotic communities within and adjacent to the Site in the summer of 2003. Specific studies included water and sediment quality investigations, sediment toxicity assessments, fish and benthic macroinvertebrate community assessments, and tissue contaminant sampling on earthworms, fish, shellfish, and wetland plants. The results of the biological tests were used to assess the bioavailability of contaminants to wildlife and humans and will support remedial action decisions.

Ten aquatic sampling stations were established in the study area, four of which were located adjacent to the Site (Site stations 3, 4, 5 & 6) while the remaining six stations intended as reference stations (reference stations 1, 2, 7, 8, 9 & 10), were located upstream and downstream of the Site in Hessian Run and Woodbury Creek. The dissolved oxygen levels and pH of surface water at Site stations in Hessian Run met the state criteria for FW2 waters. Concentrations of total recoverable lead in water at all Site stations were below the acute aquatic life protection standard, but three of the four Site stations (3, 5, and 6) exceeded the chronic aquatic life protection criteria. Sediment sampling revealed that concentrations of lead in sediments at all Site stations were greater than lead concentrations at all reference stations. Sediment lead concentrations exceeded the Lowest Effects Level of 31 ppm (LEL) at all Site stations, and lead concentrations at three of four Site stations (3, 4, and 6) also exceeded the Severe Effects Level of 250 ppm (SEL). While lead concentrations at Station 6 only slightly exceeded the SEL, lead concentrations recorded at stations 3 and 4, respectively, greatly exceeded the SEL. Based on results presented in the recent Remedial Investigation Report (RIR – Berger, 2004), the locations of Stations 3 and 4 coincide with those of the heaviest concentrations of lead bearing battery casings previously deposited along the Hessian Run shoreline. Concentrations of Aroclor 1254 and Aroclor 1260 detected at all four Site stations exceeded the LEL, but did not exceed the SEL. Concentrations of these two PCB congeners at Site station 4 were approximately ten times higher than concentrations detected at all other stations, Additionally, Site station 4 contained another PCB congener, Aroclor 1242, that was not detected at any other station in the study area.

Sediment toxicity at the ten aquatic sampling stations was investigated through acute exposure experiments using amphipods and larval midges as test organisms, with mortality and growth as measures of toxicity. In the amphipod testing, sediment from Site station 4 resulted in 100% mortality of test organisms, while Site Station 6 had significantly less test organism survival than the control (known environmental quality) sediment. Survival and growth at the other two Site stations (3 and 5) were not significantly different than survival in the control sediment. In the midge testing, sediment from Site station 4 again resulted in 100% mortality of test organisms, while the other three Site stations had significantly lower test organism survival than the control sediment. In both the amphipod and midge testing, several of the reference sites also had significantly lower survival than the control sediment.

Sediment toxicity was also investigated through a chronic exposure experiment lasting 65 days that used midges as test organisms, with the emergence of adult flies as the measure of toxicity. Significantly less emergence occurred at three of the four Site stations than the reference stations. Site station 3 also had a significantly greater number of days before first emergence than the reference stations.

The finfish community assessment compared species richness, diversity, and trophic composition at Site stations to reference stations. Only four species were caught at the Site stations, while twelve species were caught at the reference stations. Mean fish diversity at the four Site stations was considerably lower than at the six reference stations upstream and downstream in Hessian Run and in Woodbury Creek. The fish communities at the Site stations consisted almost entirely of omnivores, whereas fish communities at

the reference stations, while also primarily composed of omnivores, had a greater percentage of water-column feeders and top carnivores. In addition, three species not encountered in a 1977 fish survey of the study area (Hastings and Good, 1977) were caught during this study.

The benthic macroinvertebrate community assessment compared species richness, diversity, trophic composition, and pollution tolerance at Site stations to reference stations. Five taxa were collected at the Site stations, while nine taxa were collected at the reference stations. Mean taxa diversity of the Site stations was slightly lower than that of the reference stations. The benthic macroinvertebrate communities at Site stations and reference stations consisted almost entirely of deposit feeders, with few filter feeders or carnivores. Benthic taxa at the reference stations were primarily pollution-tolerant, but some moderately tolerant and sensitive taxa were present, while the Site stations consisted entirely of pollution-tolerant organisms.

Similar concentrations of lead were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations. PCBs were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations at similar concentrations. Concentrations of lead detected in the wetland plants spatterdock and wild rice at Site stations were considerably higher that those of the Woodbury Creek reference stations. Concentrations of two PCB congeners detected in these plant species at the Site stations were also considerably higher than at the reference stations. In earthworm tissue, lead concentrations at Site stations were over ten times greater than at the reference station. Concentrations of the two PCB congeners detected in earthworms at Site stations were eight times higher than at the reference station.

Twelve finfish species were caught in the study area. Aquatic invertebrate species observed in the study area include the nine benthic macroinvertebrates collected during the community assessment, as well as crayfish. The painted turtle, mud turtle, and snapping turtle were also observed in the study area. Dabbling waterfowl observed in the study area included ducks and Canada geese. Piscivorous birds observed in the study area included the Great Egret, Osprey, Common Tern, and Cormorant. This diversity of species represents a variety of pathways through which wildlife and humans can become exposed to lead and PCBs present at the Site.

1.0 INTRODUCTION

The Louis Berger Group, Inc. (Berger) has been contracted by the New Jersey Department of Environmental Protection (NJDEP) to perform site specific Remedial Investigations (RI) and Remedial Action Evaluations (RAS) at multiple sites throughout the state. As part of this contract, Berger conducted an Aquatic Biota Study (ABS) of the Matteo Iron and Metals site (Site) located in West Deptford, New Jersey (Figure 1).

In August and September 2003, Berger conducted studies of the aquatic habitats and biotic communities within and adjacent to the Site in order to assess the potential biological impacts of known on-site contamination. The contaminants of concem, as identified in the Remedial Investigation Report (May 2001), are lead (Pb) and PCBs. Based on a meeting with NJDEP representatives on March 14, 2001, and a Memorandum provided by the NJDEP dated November 9, 2001, these studies consisted of the following components:

- Sediment toxicity testing
- Water quality testing
- Assessment of resident benthic macroinvertebrate and fish communities, and
- Fish, plant, and benthic macroinvertebrate tissue analysis.

Results of the above biological tests may be used to support the remedial decisions beyond source removal and removal of severely contaminated sediments. If residual sediment contamination is found not to be bioavailable and risk to the aquatic biota is not indicated, further remediation of sediments may not be warranted; if bioavailability and risk are indicated, the decision for remedial action could be supported and determination of risk-based remedial goals will be facilitated by the results of the study.

1.1 Study Area Description

The Site is situated at the confluence of Woodbury Creek and Hessian Run, which experience diumal tides. Tidal fluctuations range from approximately 5.4 feet at neap tides to approximately 6 feet at spring tides. Tidal currents are strong in the vicinity of Woodbury Creek and Hessian Run, however, there is no data reported on tidal current velocities. At low tide, Woodbury Creek is approximately 10 feet deep, whereas Hessian Run is reduced to a narrow stream less than a foot deep. Both Woodbury Creek and Hessian Run are classified as FW-2NT/SE2 waterways in which there may be a fresh water/salt water interface, however, salinity measurements taken during the Remedial Investigation averaged 0.01 parts per thousand, indicating a strictly freshwater habitat.

Figure 1 presents the location of sampling stations within the study area. Berger, in consultation with NJDEP, established seven sampling stations in Hessian Run and three stations in Woodbury Creek for sediment and water sampling, and biological community assessments. All ten stations are tidally influenced. Stations 3, 4, 5, and 6 (Site stations) in Hessian Run are adjacent to the Site upland areas where previous sampling revealed high soil concentrations of lead. In addition, three upland tissue sampling stations (4E, 4.5E, and 5E) were established on-Site, and one upland tissue sampling station was established off-Site (8E).

1.2 Sampling Overview

Table 1 presents a summary of parameters investigated at each station. Since several different types of samples were taken at each station for this study, a station was comprised of a transect from the high tide line to mid-channel. Specific sampling locations along transects for each sample type are described in

each respective section below. The geographic positions of each station were collected using a Trimble XRS Global Positioning System (GPS).

Sampling and investigation activities were performed in accordance with the New Jersey Technical Requirements For Site Remediation, (NJDEP, 1997), the New Jersey Field Sampling Procedures Manual (NJDEP, 1992); Guidance for Sediment Quality Evaluations (NJDEP, 1998), and where applicable, other relevant or appropriate United States Environmental Protection Agency (USEPA) regulations and guidance for conducting investigations at uncontrolled hazardous contamination sites.

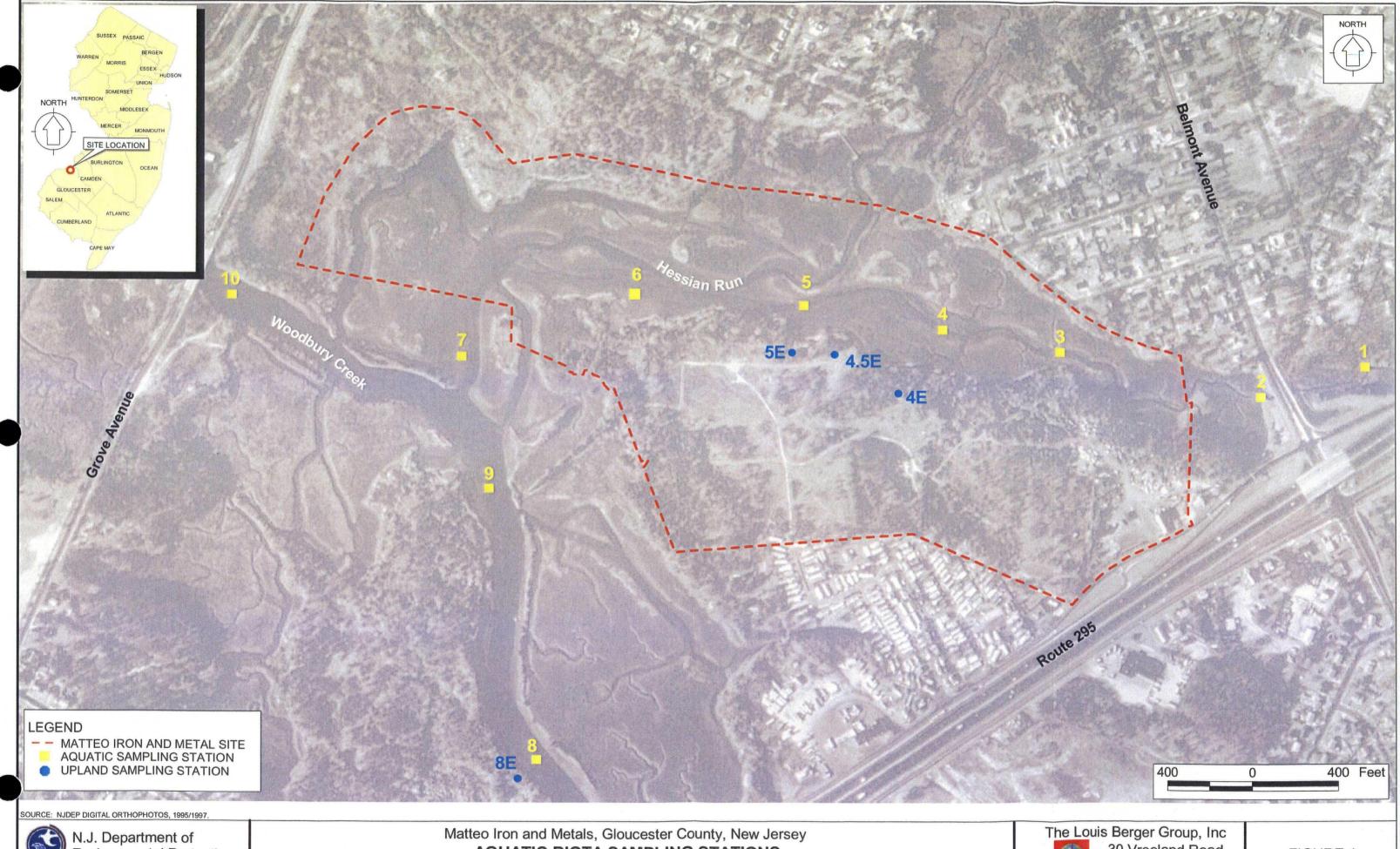


Table 1. Aquatic Biota Study sampling summary.

Station	Fish and Benthic	Sediment Chemistry	Water	Tissue	Contam	nant Ana	lysis
	Community Assessment	and Toxicity	Quality	Benthic Invertebrate	Fish	Plant	Earthworm
1*	X	X	X				
2*	X	X	X				
3	X	X	X	X	X		
4	X	X	X	X	X	X	
5	X	X	X	X	X	X	
6	X	X	X			X	¥-
7*	X	X	X				
8*	X	X	X	X	X	X	
9*	X	X	X	X	X	X	
10*	X	X	X	X	X	X	
4E							X
4.5E							X
5E							X
8E*							X

^{*} Intended as reference stations

2.0 WATER AND SEDIMENT QUALITY

2.1 Water Quality

2.1.1 Methods

Water quality samples and in-situ measurements were collected at all 10 stations on August 18 and 19 at high tide within the approximate quarter channel nearest the site. Surface water samples were collected using Kemmerer samplers, and were analyzed for lead, total hardness, and pH. In-situ parameters including temperature, salinity, conductivity, and dissolved oxygen were collected at each station using a YSI 610DM/6820 Environmental Monitoring System (EMS) data logger. Detailed field notes including time of day and tidal condition were recorded.

2.1.2 Results

Table 2 presents lead concentration, total hardness and pH of water samples in the study area. Sample IDs ending in "D" indicate filtered water samples in which the lead concentrations shown are for dissolved lead. Table 3 presents the in-situ water quality data for the study area.



Figure 2. Water quality sampling in Woodbury Creek.

Table 2. Lead concentration, total hardness and pH of water samples in the study area.

Station	Sample ID	pH (Std. Units)	Total Hardness (ppm)	Lead (ppb)	Acute Lead Criterion* (ppb)	Chronic Lead Criterion* (ppb)
1	SW1	7.2	228	1.3 U	156.4	6.1
2	SW2	7.2	176	5.6	118.8	4.6
	SW2D	NA	NA	2.8U	NA	NA
3	SW3	7.3	160	8.9	107.3	4.2
	SW3D	NA	NA	2.8U	NA	NA
4	SW4	7.2	228	4.0	156.4	6.1
	SW4D	NA	NA	2.8U	NA	NA
5	SW5	7.3	100	5.9	64.6	2.5
	SW5D	NA	NA	2.8U	NA	NA
6	SW6	7.3	132	19.5	87.3	3.4
	SW6D	NA	NA	2.8U	NA	NA
7	SW7	7.2	136	3.4	90.1	3.5
	SW7D	NA	NA	2.8U	NA	NA
8	SW8	7.2	116	3.2	75.9	3.0
7	SW8D	NA	NA	2.8U	NA	NA
9	SW9	7.3	108	2.8U	70.2	2.7
	SW9D	NA	NA	2.8U	NA	NA
9	SWDUP	7.3	112	2.8U	73.0	2.8
	SWDUPD	NA	NA	2.8U	NA	NA
10	SW10	7.2	76	5.0	47.8	1.9
	SW10D	NA	NA	2.8U	NA	NA

ppm = parts per million (milligrams/liter); ppb = parts per billion (micrograms/liter)

U = not detected above the sample quantitation limit (SQL)

Bolded values indicate positive detections

Italicized values indicate exceedances of acute or chronic criteria

Table 3. In-situ water quality data for the study area.

Station	Temperature (°C)	Salinity (ppt)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)
1	27.7	0.11	0.254	5.78
2	27.1	0.11	0.237	5.90
3	26.9	0.11	0.233	6.03
4	27.7	0.11	0.247	5.64
5	26.9	0.11	0.236	6.01
6	26.7	0.11	0.238	6.11
7	25.5	0.10	0.223	4.27
8	25.9	0.10	0.225	4.63
9	25.0	0.10	0.221	3.20
10	25.3	0.10	0.220	4.28

NA = Not analyzed

^{*}Corrected for total hardness

The surface water at all ten stations fell within the FW2 pH criteria of 6.5 to 8.5. Dissolved lead was not detected in any of the filtered samples, but lead (total recoverable) was detected in unfiltered samples from most stations. Lead concentrations were corrected for total hardness and acute and chronic aquatic life protection criteria were calculated for each sample. No station exceeded the acute life protection standard, but Stations 2, 3, 5, 6, 8, and 10 exceeded the chronic aquatic life protection criteria. Dissolved oxygen levels at all stations met the minimum NJDEP concentrations for FW2 waters of 4.0 mg/L, except Station 9 which is located off-Site.

2.2 Sediment Quality

2.2.1 Methods

Berger collected surface sediment samples (0 - 6) below ground surface) from the seven stations within the mudflats and various wetland habitats of Hessian Run and the three stations in Woodbury Creek for the range of lead and PCB concentrations that would remain outside of the remedial footprint. Sediment samples were taken from the mid-tide level at each station at low tide.

2.2.2 Results

Sediment chemistry and contaminant concentrations appear in Table 4.



Figure 3. Sediment collection in Hessian Run.

Table 4. Sediment chemistry and contaminant concentrations.

Sediment						Co	ontamina	minants (ppm)						
Station	Sample ID	pH (Std. Units)	Total Organic Carbon (ppm)	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260			
1	SED1	6.4	101,200	217	0.05U	0.05U	0.05U	0.05U	0.05U	0.15J	0.15			
2	SED2	6.6	55,800	175	0.04U	0.04U	0.04U	0.04U	0.04U	0.2	0.14			
3	SED3	6.8	77,000	19,600	0.11U	0.11U	0.11U	0.11U	0.11U	0.39	0.23			
4	SED4	6.6	151,700	2,200	1.40U	1.40U	1.40U	7J	1.40U	10	18			
5	SED5	6.6	70,600	248	0.10U	0.10U	0.10U	0.10U	0.10U	1.2	0.44			
6	SED6	6.4	155,800	349	0.083U	0.083U	0.083U	0.083U	0.083U	0.3	0.11			
7	SED7	6.0	31,400	168	0.071U	0.071U	0.071U	0.071U	0.19J	0.66J	0.38			
8	SED8	5.2	18,300	70	0.032U									
9	SED9	6.9	25,200	96.1	0.052U	0.052U	0.052U	0.052U	0.077	0.16J	0.089J			
9	SEDDUP	6.6	40,800	107	0.044U	0.044U	0.044U	0.044U	0.094J	0.18J	0.12J			
10	SED10	6.2	29,700	88	0.03U									
TELEPHONE STATE OF THE STATE OF	ects Levels* in ppm	NA	NA	31	0.007	NA	NA	NA	0.030	0.060	0.005			
	ects Levels* in ppm	NA	NA	250	53	NA	NA	NA	150	34	24			

U = not detected above the sample quantitation limit (SQL)

Bolded values indicate positive detections

Sediment lead concentrations at the reference stations (1, 2, 7, 8, 9, and 10) ranged from 70 to 217 ppm while concentrations at the Site stations (3, 4, 5 & 6) ranged from 248 to 19,600 ppm (see Figure 4). Aroclor 1242 was detected at Station 4, while Aroclor 1248 was detected at Stations 7 and 9. Concentrations of Aroclor 1254 and 1260 were detected at all stations except 8 and 10 (see Figure 5). At Station 4, concentrations of Aroclor 1242, 1254, and 1260 ranged from 7 to 18 ppm. Concentrations of Aroclor 1242, 1254, and 1260 detected at all other stations ranged from 0.077 to 1.2 ppm.

Sediment samples were compared to the Lowest Effect Level (LEL) and Severe Effects Level (SEL) Sediment Quality Criteria (SQC) (NJDEP, 1998). The LEL is the concentration at which adverse benthic impacts are found in approximately 10% of studies. NJDEP has determined that the LEL provides the most accurate screening criteria to evaluate sediment contaminants of concern. The LEL values are not cleanup standards, but screening guidelines for use in the Baseline Ecological Evaluation. An exceedance indicates a potential risk to the benthic community. The SEL indicates severe benthic impacts in 95% of studies. The SEL is provided for information purposes; NJDEP does not use the SEL as a screening criteria. These criteria were developed based on benthic community studies of sediment samples and do not directly address biomagnification (food chain toxicity) to birds and mammals. However, values found to be protective of the food chain are generally similar (within an order of magnitude) to LEL values. Lead concentrations exceeded the LEL at all ten stations, and lead concentrations at Stations 3, 4, and 6, also exceeded the SEL. While lead concentrations at Station 6 (349 ppm) only slightly exceeded the 250 ppm SEL, lead concentrations of 19,600 and 2,200 ppm recorded at Stations 3 and 4, respectively, greatly exceeded the 250 ppm SEL. Based on results presented in the recent Remedial Investigation Report (RIR - Berger, 2004), the locations of stations 3 and 4 coincide with those of the heaviest concentrations of lead bearing battery casings previously deposited along the Hessian Run shoreline (see Figure 20 at the end of this report). Concentrations of Aroclor 1248, Aroclor 1254, and Aroclor 1260 detected at stations in the study area all exceeded the LEL, but none exceeded the SEL.

J = estimated concentration

^{*} LEL and SEL values from NJDEP's Guidance For Sediment Quality Evaluations (1998)

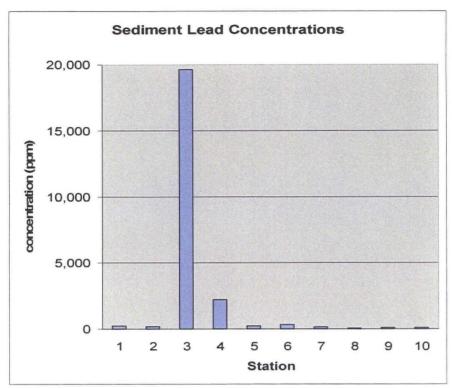


Figure 4. Sediment lead concentrations within study area.

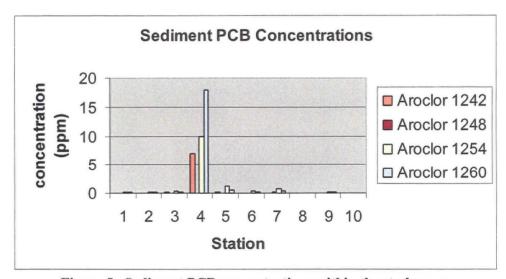


Figure 5. Sediment PCB concentrations within the study area.

3.0 SEDIMENT TOXICITY TESTING

Two gallons of surface sediment (0 - 6) below ground surface) were collected from all ten aquatic stations in the study area for sediment toxicity testing. These sediment samples were taken at the same times and locations as the sediment samples collected for the sediment quality investigation discussed above. Sediment toxicity was investigated by conducting survival and growth testing on two test organisms, the midge *Chironomus tentans*, and the amphipod *Hyalella azteca*, and by conducting growth endpoint (emergence) testing on C, tentans.

Data analysis was performed following procedures published by the USEPA (2000) using the Toxstat (1994) data analysis software. All data were transformed by arcsine squareroot and then tested for normality using the Shapiro-Wilk's test or the Chi-Square test and for homogeneity of variance using Bartlett's test, as appropriate. Analysis of variance (ANOVA) followed by Durmett's *a posteriori* pairwise comparisons or Steel's Many-One Rank test, as appropriate, to evaluate differences between site samples and the control sample.

3.1 Acute Testing- Effects on Survival and Growth

3.1.1 Hyalella azteca

The sediment samples from the study area were evaluated for toxicity using a 28-day solid phase exposure with the amphipod *Hyalella azteca*. The sediment exposure series consisted of sediment samples from each of the ten stations in the study area and one of control sediment of known environmental quality (Spruce Run Reservoir). The endpoints used for determination of an impact in the amphipod exposures were mortality, measured as mean survival, and growth, measured as mean dry weight.

For each station, five replicate test chambers were filled with sediment over which test water was poured. The exposure period began by placing 10 randomly selected test organisms into each chamber. Observations were made and recorded for each chamber each day during the exposure period to assess organism health. Observations included the number of organisms dead, swimming, on the surface of the sediment, or on the surface of the water. At the end of the 28-day exposure, the sediment was carefully sorted and the surviving test organisms removed for live count verification and weight determination. The full details of this test, including raw data and statistical analysis, are provided in Appendix A.

The data were found to be normally distributed. Data were also tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival and growth of organisms in all samples and the control sample.

Effects on Survival

Results from the analysis, which compared survival in all samples with survival of organisms exposed to the control sample, are presented in Table 5. Samples from Station 4 caused 100% mortality and were eliminated from the analysis. Samples from stations 1, 2, 3, 5 and 8 did not produce mortality statistically different from the control exposure. Amphipods exposed to samples from stations 6, 7, 9 and 10 had significantly lower survival than those exposed to the control treatment, and were not included in the weight comparisons.

Table 5. Percent survival of *H. azteca* by replicate chamber and survival comparison with control sample.

sampic.											
30a					S	tation					
Replicate ≤	Control.	251	2	3	4*	5	4 6	7.	8.4	9 9世	10
A	100	100	100	90	0	100	100	70	100	60	90
В	90	90	100	80	0	100	70	40	100	80	60
C.	100	90	100	90	0	80	60	70	90	100	80
· D	100	100	90	70	0	100	60	60	80	70	60
. ∍E	100	100	80	90	0	80	60	40	90	70	50
Mean % Survival	98.0	96.0	94.0	84.0	0	92.0	70.0	56.0	92.0	76.0	68.0
Statistically Different from Control	-	No	No	No	Yes	No	Yes	Yes	No	Yes	Yes

^{*} Sample 4 not included in ANOVA due to 100 % mortality.

Effects on Growth

Results from the analysis which compared mean dry weights for stations 1, 2, 3, 5 and 8 to the control sample are presented in Table 6. Of the five stations that did not exhibit excessive mortality compared to the control sample, stations 1, 2, 3 and 5 did not have mean dry weights significantly different from the control exposure. Only Station 8 was found to have significantly less average dry weight than the control exposure.

Table 6. Mean dry weight (mg) of *H. azteca* by replicate chamber and growth comparison with control sample.

			Stati	ion :	The state of the s	
Replicate	Control	25.12	2//	3	55	. 8
A	0.067	0.087	0.073	0.053	0.082	0.039
B.	0.077	0.083	0.108	0.074	0.076	0.065
C.	0.076	0.106	0.079	0.073	0.091	0.058
D	0.080	0.086	0.072	0.083	0.058	0.071
. E94	0.079	0.101	0.075	0.081	0.069	0.050
Mean Dry Weight (mg)	0.076	0.093	0.081	0.073	0.075	0.057
Statistically Different from Control	-	No	No	No	No	Yes

3.1.2 Chironomus tentans

The sediment samples from the site were also evaluated for toxicity using a 20-day solid phase exposure with the midge *Chironomus tentans*. Like the amphipod tests, the sediment exposure series consisted of sediment samples from each of the ten stations in the study area and one of control sediment of known environmental quality (Spruce Run Reservoir). The endpoints used for determination of an impact in the midge exposures were mortality, measured as mean survival, and growth, measured as mean dry weight.

The test chambers were prepared the same as for the amphipod tests, and the number of replicate samples was the same, but for the midge, 12 individuals were placed into each chamber. Observations were made and recorded for each chamber each day during the exposure period to assess organism health. Observations included the number of organisms dead, swimming, on the surface of the sediment, or on the surface of the water. At the end of the 20-day exposure, the sediment was carefully sorted and the surviving test organisms removed for live count verification and weight determination. The full details of this test, including raw data and statistical analysis, appear in Appendix B.

The data were found to be normally distributed. Data were also tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Durmett's pairwise comparisons were used to determine differences between survival and growth of organisms in all samples and the control sample.

Effects on Survival

Results from the analysis which compared survival in all samples with survival of organisms exposed to the control sample are presented in Table 7. Once again, samples from Station 4 caused 100% mortality and were eliminated from analysis. Samples from stations 8 and 9 did not produce mortality statistically different from the control exposure. Chironomids exposed to samples from stations 1, 2, 3, 5, 6, 7 and 10 had significantly less survival than those exposed to the control treatment, and were not included in the weight comparisons.

It should be noted that the recommended minimum control survival for chironomids in a 20-day exposure is 70% and this data set produced control survival of 66.7%. This decreased survival in the control may be an artifact of the handling procedures of the newly hatched test organisms during their placement into the test chambers. Since the <24 hour old midge larvae need to be sorted under a dissecting microscope to facilitate their removal from the egg case debris, they are not placed in an interim holding vessel prior to introduction to the test chambers. They are placed directly into the test exposure chambers and this limits the amount of observation time to replace those individuals that may have been adversely affected by handling. As the survival rates for the site samples are markedly lower than the controls, this slight depression in the control survival does not appear to have any adverse impact on the data analysis.

Table 7. Percent survival of *C. tentans* by replicate chamber and survival comparison with control sample.

	. E.				St	ation					
Replicate	C ontrol	122	2	3 3	. 4 * ∵	5	6-	7	8 8	. 9 .	10.
A	58.3	50	33.3	0	0	16.7	33.3	16.7	50	8.3	16.7
- B-	66.7	50	8.3	16.7	0_	25	58.3	8.3	75	41.7	16.7
C/	58.3	33.3	16.7	0	0	50	0	8.3	58.3	58.3	41.7
D	75	0	66.7	0	0	16.7	50	16.7	100	66.7	8.3
E;*	75	0	0	8.3	0	16.7	25	33.3	66.7	33.3	33.3
Mean % Survival	66.7	26.7	25	5	0	25	33.3	16.7	70	41.7	23.3
Statistically Different from Control	-	Ye s	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Ye s

^{*} Sample 4 not included in ANOVA due to 100 % mortality

Effects on Growth

Results from the analysis which compared mean dry weights for stations 8 and 9 to the control sample are presented in Table 8. Neither of these stations had mean dry weights significantly different from the control exposure.

Table 8. Mean dry weight (mg) of C. tentans by replicate chamber and growth comparison with

control sample.

		Station	
Replicate	Control	. 8	9.
A	0.789	0.583	1.98
B	0.768	0.550	0.516
Carry Na	0.670	0.624	0.579
D	0.450	0.515	0.650
E	0.48	0.695	0.998
Mean Dry Weight (mg)	0.645	0.593	0.945
Statistically Different from Control	-	No	No

3.2 Growth Endpoint - 65-day Exposure

The sediment samples from stations in the study area were also evaluated for toxicity using a 65-day solid phase exposure with the midge *Chironomus tentans*. The endpoints used for determination of an impact in the midge exposures were number of flies which had emerged from the sample sediment.

Like the other tests, the sediment exposure series consisted of sediment samples from each of the ten stations in the project area and one of control sediment from Spruce Run Reservoir. The test chambers were prepared the same as for the 20-day midge tests and the number of replicate samples and test organisms was the same. Observations including the number of organisms dead, swimming, on the surface of the sediment, or on the surface of the water were made and recorded daily to assess organism health. The full details of this test, including raw data and statistical analysis, are provided in Appendix C.

Beginning on Day 20, all test chambers were tightly covered with fine mesh nylon window screen and rubber bands. These covers retained emergent adults in their respective chambers so they could be recorded twice per day. Those individuals that achieved complete emergence were recorded as adult flies to be used in the statistical analysis of this endpoint. Incomplete emergence, those individuals that successfully began to emerge from the pupae, but then became caught, or expired in the process, were recorded as such but not included in the statistical analysis. There were only two individuals that were recorded as incomplete emergents.

On Day 44 of the exposure, the controls reached a total emergence of 53.3% (32 of original 60 test individuals). As this was the final endpoint being assessed, the control treatment could be ended when it achieved >50% emergence of original test organisms. At this time, each test sample was evaluated individually on a daily basis to determine when it should end. Once a site sample had not recorded a new

emergent adult for seven consecutive days after the control treatment ended, that set of five replicate chambers was carefully sorted and all remaining surviving test organisms were recorded.

Effects on First Emergence

The number of days each replicate took to produce the first adult was recorded as a percentage of the total time of the test exposure, 65 days. The data were found to be normally distributed. Data were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival of organisms in all samples and the control sample.

Results from the analysis, which compared the time to first emergence in all samples with that of Stations 8 and 9, the two reference stations, are presented in Table 9. The control values are included for comparative purposes.

Of the sample stations in the study area, only Station 3 was found to have a significantly greater number of days to first emergence. All remaining stations: 4, 5, 6, 7 and 10 did not produce values statistically different from either of the reference stations. Stations 1 and 2 are not included in this analysis as they were originally designed to be used as reference stations, but unacceptable survival precluded their use as references.

Table 9. Average time to 1st emergence of *C. tentans* by sample station, using Stations 8 and 9 for

comparison.

Station	Average Days to	%_of 65 Day∷	Significant vs.	Significant vs.
	1st Emergence	Ex po s ure	Station 8 ²	Station 9 ²
Control :	29.2	44.9	-	-
8	31.4	48.3	-	N/A
9 💮	30.8	47.4	N/A_	-
3	51.2	78.8	Yes	Yes
4	41.6	64.0	No	No
5	40.8	62.8	No	No
6 - 6	36.6	56.3	No	No
7	33.6	51.7	No	No
10	31.2	51.1	No	No

^{1 -} Control included for comparison only

Effects on Total Emergence-Comparison with Station 8

Results from the analysis which compared the total emergence in all samples with that of Station 8 are presented in Table 10. Emergence is evaluated at seven day intervals beginning with Day 44, when the control treatment reached >50% emergence. The control value is included for comparative purposes.

Station 8 ended on day 61, with a total emergence of 66.8%. It should be noted here that at Day 44, when the control treatment surpassed the 50% emergence level, Station 8 had produced 48.4% emergent adults. However, the criterion for the ending any sample treatment was no emergent individuals for seven consecutive days, so Station 8 continued until Day 61. Of the stations in the project area compared with reference station 8, Stations 6 and 7 at no time showed a significant difference in total emergence on any

^{2 –} Reference stations not compared to each other

of the days used for evaluation (44, 51, 58 and 65). Of the four remaining stations; 3, 4, 5 and 10, all had significantly less emergence at day 44 compared to Station 8. At 51 days, Station 3 had ended, Stations 4 and 5 were still statistically different compared to Station 8, and Station 10 had produced sufficient numbers of adults to not be significantly different at day 51. At 58 days, Station 5 had ended, and Stations 4 and 10 were different from the reference. At the end of the test, Day 65, Station 4 had ended and Station 10 was again not statistically different from station 8. Stations 3, 4 and 5 have been highlighted in the table below to show that at all points during the exposure period these samples were producing significantly different responses compared to that of the reference (Station 8). The last sample from Station 10, appears to have suffered some deleterious response, however, the statistical analysis at Day 65 did not find the final emergence of 39.4% to be different from the reference sample.

Table 10. Total emergence of C. tentans by station using Station 8 for comparison.

Table 10.	I Otal Cilici	genee or c.	tentuns by	station asin	g station o	TOT COMPA	15011.	
S tation.	Percent Emergence @ 44 days	Significant vs. sta. 8 @ 44 days	Percent Emergence @ 51 days	Significant vs. sta. 8 @ 51 days	Percent Emergence @ 58 days	Significant vs. sta. 8 @ 58 days	Percent Emergence @ 65 days	Significant vs. sta. 8 @ 65 days
Control.	53.4	-	-	-	-	-	-	
8	48.4	-	61.6	_	66.8	-	66.8	
3	3.2	Yes	Ended	•	•	-	-	_
4	16.4	Yes	19.8	Y e s	19.8	Y e s	Ended	-
5.	16.6	Y e s	16.6	Yes	Ended	<u>-</u>	-	_
6	35	No	48.2	No	70	No	76.8	No
7	28.2	No	41.6	No	46.6	No	46.6	No
1 0	24.8	Yes	34.8	No	34.8	Yes	39.8	No

Effects on Total Emergence-Comparison with Station 9

Results from the analysis which compared the total emergence in all samples with that of Station 9 are presented in Table 11. Emergence is evaluated at seven-day intervals beginning with Day 44, when the control treatment reached >50% emergence. The control value is included for comparative purposes.

Station 9 ended on Day 65, with a total emergence of 71.6%. It should be noted here that at Day 44, when the control treatment surpassed the 50% emergence level, Station 9 had produced 45.2% emergent adults. However, the criterion for the ending any sample treatment was no emergent individuals for seven consecutive days, so Station 9 continued until Day 65. Of the stations in the study area compared with reference Station 9, Stations 6 and 7 at no time showed a significant difference in total emergence on any of the days used for evaluation (44, 51, 58 and 65). Of the four remaining stations; 3, 4, and 5 had significantly less emergence at Day 44 compared to station 9. Station 10 was not significantly different from reference Station 9. At 51 days, Station 3 had ended, Stations 4 and 5 were still statistically different compared to Station 9, and Stations 6, 7 and 10 were not significantly different from Station 9. At the end of the test, Day 65, Station 4 had ended, Stations 6 and 7 ended with no difference compared to Station 9 and Station 10 remained statistically different from Station 9. Stations 3, 4 and 5 have been highlighted in the table below to show that at all points during the exposure period these samples were producing significantly different responses compared to that of Station 9.

Table 11. Total emergence of C. tentans by sample location using Station 9 for comparison.

Station	Emergence	Significant vs. sta. 9 @ 44 days	Percent Emergence @ 51 days	Significant vs. sta. 9 @ 51 days	Percent Emergence @ 58 days	Significant vs. sta. 9 @ 58 days	Percent Emergence @ 65 days	Significant vs. sta. 9 @ 65 days
Control	Lie Committee of	_	_	- -	-	-	-	-
9 - 2	45.2	-	58.4	-	66.8	_	71.6	
/3.24	3.2	Yes	End e d	-	-	_		_
4	16.4	Yes	19.8	Yes	19.8	Yes	End e d	-
5.	16.6	Yes	16.6	Yes	End e d	-	-	-
6	35	No	48.2	No	70	No	76.8	No
7	28.2	No	41.6	No	46.6	No	46.6	No
10	24.8	No	34.8	No	34.8	Yes	39.8	Yes

Effects on Total Survival

Results from the analysis which compared the total survival in all samples with that of Stations 8 and 9 are presented in Table 12. The control values are included for comparative purposes. The remaining stations; 1, 2 and 10 were considered as ahernate reference stations but imacceptable survival precluded their use as references. The recommended minimum survival for the emergence portion of this test is 65% at the completion of testing. The control treatment as well as Stations 8 and 9 exceeded this level of surviving test organisms.

Of the sample stations in the study area, Station 3 was found to have a significantly lower survival than Stations 8 and 9. Stations 4 and 7 were found to have statistically different survival rates when compared to Station 9.

Table 12. Total survival of C. tentans by sample location using Stations 8 and 9 for comparison.

			0: ::	
Station	Pèrcent Total Survival	Significant vs. Control	Significant vs. Station 8	Significant vs. Station 9
Control ¹	88.3	-	-	-
18 18 18 18 18 18 18 18 18 18 18 18 18 1	25.0	Yes	_	-
2 %	40.0	Yes	-	-
3	50.0	-	Yes	Yes
4	21.7	-	No	Yes
5	81.7	-	No	No
6	81.7	-	No	No
7.7	46.7	-	No	Yes
8 3 3	68.3	No	-	NA
9	80.0	No	NA	-
10	55.0	Yes	No	No

^{1 –} Control included for comparison only

NA - Stations 8 and 9 were not compared to each other

4.0 FISH AND BENTHIC MACROINVERTEBRATE COMMUNITY ASSESSMENTS

4.1 Fish Community Assessment

4.1.1 Methods

Berger conducted an assessment of the resident fish communities to evaluate the ecological integrity of the aquatic system adjacent to the Site. Berger collected fish samples from each of the seven stations within Hessian Run and three stations within Woodbury Creek (Figure 1). Berger utilized fish collected during this effort to supply tissue samples for the analyses described in Section 5.1. Fish samples were collected using a 30-foot beach seine (0.25-inch mesh) (Figure 6), except at Stations 1, 2, and 3 in Hessian Run where a 10-foot seine (0.25 inch mesh) was used because of the narrow channel width. Three replicate hauls were made within two hours of low tide at each station in the opposite direction of the prevailing tidal current. Each haul attempted to cover 20 meters of the substrate, but in many cases, submerged obstructions such as logs and stumps limited hauls to shorter distances. Fish were identified in the field and counted, and 25 individuals of each species were measured per replicate sample, if available.

4.1.2 Results

Table 13 presents the fish species richness, diversity, and trophic composition at each of the 10 stations sampled during the study. Results of the fish survey were compared with historical studies conducted within the project vicinity (e.g., Hastings and Good, 1977). Raw fish data and statistical summary are provided in Appendices D and E.



Figure 6. Finfish sampling at Station 5 in Hessian Run, looking west.

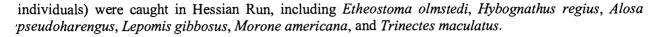
Table 13. Fish species abundance, richness, diversity, and trophic composition.

1 adie 13. Fish						Abun	CV CONTRACTOR				6.4		tals 🐫 👢
Species Name	Common Name					Sta	ion .					Stations 3, 4, 5	Reference
	Park Control	21%	* 2	3	- :4 :	5.∞.	6	7	8	9 ;	10	and 6	Stations
Fundulus diaphanus	Banded Killifish	14	3	15	306	67	50	22	370	384	61	438	854
Fundulus heteroclitus	Mummichog	8	6	12	708	224	26	16	2	15	4	970	51
Etheostoma olmstedi	Tessellated darter	1						3	10	1	5		20
Hybognathus reglus	Eastem Silvery Minnow	1	1						2	38	42		84
Alosa pseudoharengus	Alewife				2			3_	39	4	13	2	59
Lepomis gibbosus	Pumpkinseed		1		7	1		1	2	_ 5	1	8	10
Anguitia rostrata	American Eel								3	2			5
Anchoa spp.	Anchovy								2	_ 1			3
Menidia menidia	Silversides										1		1
Morone americana	White Perch		1					1	44	19	14		79
Morone saxatilis	Striped Bass								4		2		6
Trinectes maculatus	Hogchoker							1	3				4
	Total	24	12	27	1023	292	76	47	481	469	143	1418	1176
	Species Richness								2000				
(total number	of species caught)	4	5	2	4	3	2	7	11	9	9	4	12
Shannon-Weav	er Diversity Index						******						
(mean o	f station replicates)	0.334	0.275	0.298	0.288	0.260	0.279	0.510	0.390	0.306	0.586	0.287	0.473
Tro	phic Composition												
% omnivores		96	83	100	99	100	100	81	78	93	76	99	84
% bottom in	% bottom invertebrate feeders		0	0	0	0	0	9	3	0	3	0	2
	ter column feeders	0	8	0	11	0	0	9	9	2	10	1	6
•	% top camivores	0	8	0	0	0	0	2	11	4	11	0	8

Species Richness and Diversity

Overall, twelve species of fish were caught in the study area. Of these, four species are freshwater (Fundulus diaphanus, Etheostoma olmstedi, Hybognathus regius, and Lepomis gibbosus), six are estuarine and marine (Fundulus heteroclitus, Anchoa spp., Menidia menidia, Morone americana, Morone saxatilis, and Trinectes maculatus), and two are diadramous (Alosa pseudoharengus and Anguilla rostrata). Only four species were caught at stations adjacent to the Site (Stations 3, 4, 5, and 6), while twelve species were caught at the reference stations.

For stations adjacent to the Site (Stations 3, 4, 5, and 6), diversity was particularly low, with the catch consisting almost entirely of *F. diaphanus* and *F. heteroclitus*, with only a few individuals of *A. pseudoharengus* and *L. gibbosus* caught. Mean fish diversity at these four stations, as measured by the Shannon-Weaver Diversity hidex, was 0.287, while at the reference stations upstream and downstream in Hessian Run and in Woodbury Creek, the fish diversity index was 0.473. Fish species caught in Woodbury Creek included *Anguilla rostrata*, *Anchoa* spp., *Menidia menidia*, and *Morone saxatilis*, in addition to the eight species caught in Hessian Run. Fish diversity was relatively low in Hessian Run, compared to Woodbury Creek. *Fundulus diaphanus* and *Fundulus heteroclitus* comprised over 98% (1,477 of 1,501) of fish caught in Hessian Run. Very low numbers of six additional species (24)



Trophic Composition

The trophic composition of the fish communities at stations in Hessian Run and Woodbury Creek is depicted in Table 13. Trophic compositions are based on the percentage of individuals which are either omnivores (Fundulus diaphanus, Fundulus heteroclitus, Hybognathus regius, and Menidia menidia), bottom invertebrate feeders (Etheostoma olmstedi and Trinectes maculatus), water column feeders (Alosa pseudoharengus, Lepomis gibbosus and Anchoa spp.), or top camivores (Anguilla rostrata, Morone americana, and Morone saxatilis). Because of the dominance of F. diaphanus and F. heteroclitus in the fish communities of the study area, omnivores dominate these communities. The fish communities at Hessian Run stations consisted largely of omnivores (86% to 100%), with few fish in the other trophic levels, particularly Stations 3, 4, 5, and 6 (on-Site) which consisted almost entirely of omnivores (99% to 100%). Omnivores were also dominant at the Woodbury Creek stations (76% to 93% of individuals), but to a lesser degree than in Hessian Run. The greatest proportion of top camivores in the community was found at stations in Woodbury Creek.

Comparison with Previous Studies

Station 2 and 7 in Hessian Run and Station 9 in Woodbury Creek were also sampled by Hastings and Good (1977) during August, allowing direct comparisons of species richness (Table 14). Unfortunately, no sampling was performed adjacent to the Site in the 1977 study, so no comparisons with the Site across time is possible. In Hessian Run, the same number of species was caught in both studies (8). However, the 1977 study encountered three species, Anguilla rostrata, Notropis hudsonius, and Pinephales notalus, which were not found in 2003. Three species, Etheostoma olmstedi, Alosa pseudoharengus, and Trinectes maculatus, were caught in 2003 but were not encountered in 1977. A. pseudoharengus was caught in 2003 in Hessian Run during other sampling months in 1977, but E. olmstedi and T. maculatus were not caught in either Hessian Run or Woodbury Creek in 1977. Since the 1977 study spanned several months, it is unlikely that these two species occurred there at that time. The present study did not catch A. rostrata in Hessian Run during the fish community assessment, but several individuals were subsequently caught within Hessian Run during invertebrate tissue collection efforts.

At Station 9 in Woodbury Creek, the same number of species (9) was caught in both studies, however, the 1977 study reported four species not found in 2003: Pinephales notalus, Pomoxis nigromaculatus, Notemigonus crysoleucas, and Alosa aestivalis. Four species, Etheostoma olmstedi, Lepomis gibbosus, Anguilla rostrata, and Anchoa spp. were found in 2003 but not in August 1977, however, L. gibbosus and A. rostrata were caught in Woodbury Creek during other sampling months in 1977. E. olmstedi and Anchoa spp. were not caught in either Hessian Run or Woodbury Creek in 1977, and since that study spanned several months, it is unlikely that these two species occurred there at that time.

Looking beyond Station 9, several other species not observed in Woodbury Creek in August 1977 were caught in 2003, including *Menidia menidia* and *Morone saxatilis*. Again, the 1977 study spanned several months, so it is unlikely that these species would have been missed had they been present.

Table 14. Comparisons of fish communities at stations sampled during both the present study and

the 1977 study.

ıy.	Taken a company of the company of th	n Run 2 and 7)	Woodbury Creek (Station 9)			
Species.	1977	2003	1977	2003		
Fundulus diaphanus	х	х	х	х		
Fundulus heteroclitus	х	X	X	X		
Etheostoma olmstedi		х		Х		
Hybognathus regius	x*	X	x	X		
Alosa pseudoharengus		х_	х	X		
Lepomis gibbosus	х	X		X		
Anguilla rostrata	х			X		
Anchoa spp.				X		
Menidia menidia						
Morone americana	х	х	х	x		
Morone saxatilis						
Trinectes maculatus		x				
Notropis hudsonius	х					
Pinephales notalus	х		Х			
Pomoxis nigromaculatus			_X ·			
Notemigonus crysoleucas			х			
Alosa aestivalis			Х			
Total species	8	8	9	9		

X = present

Occurrence and Length Frequency Distributions of Fundulus spp.

Fundulus diaphanus and Fundulus heteroclitus constituted approximately 89% of the total number of fish caught during the study. These two species were nearly equally abundant overall, but F. heteroclitus in Hessian Run outnumbered F. diaphanus by 2 to 1 (1,000 to 477); whereas in Woodbury Creek, F. diaphanus outnumbered F. heteroclitus by nearly 40 to 1 (815 to 21). F. heteroclitus is an extremely hardy species and is able to tolerate the more stressful environmental conditions encountered in Hessian Run at low tide when the water may be less than a foot deep. F. diaphanus was relatively more abundant in Woodbury Creek near low tide, where environmental conditions are much less variable than in Hessian Run.

The length frequency distributions of *F. diaphanus* and *F. heteroclitis* in the study area appear in Figures 7 and 8. Lengths from the three replicates at each station were pooled. Members of the 2002 and 2003 year classes of both species were found in Hessian Run and Woodbury Creek. These year classes for *F. diaphanus* consist of distinct peaks at 35 mm and 68 mm, while for *F. heteroclitus*, the peaks are less distinct but appear at 38 mm and 59 mm, with a possible third year class at 75 mm.

^{*}Identified as Hybognathus nuchalis by Hastings and Good

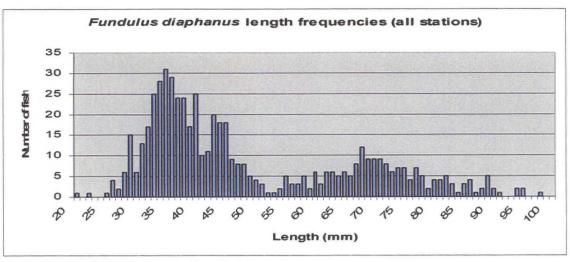


Figure 7. Fundulus diaphanus length frequencies in the study area.

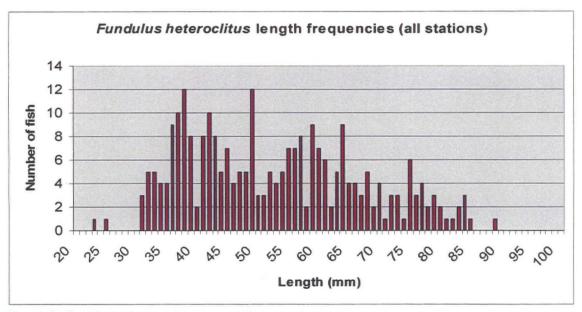


Figure 8. Fundulus heteroclitus length frequencies in the study area.

4.2 Benthic Macroinvertebrate Community Assessment

Berger conducted an assessment of the resident benthic macroinvertebrate communities to evaluate the ecological integrity of the aquatic system adjacent to the Site. Berger collected benthic macroinvertebrate samples from each of the seven stations within Hessian Run and the three stations within Woodbury Creek (Figure 1). The substrate composition throughout the study area is predominately silt and mud with underlying clay. Benthic cores were obtained by advancing a 100 mm by 100 mm hand-held square core 100 mm into the substrate at the water's edge at low tide. Three replicate samples were taken at each station, several feet apart from each other. Each sample was washed through a 0.5 mm sieve bucket and fixed in 95% ethanol. Samples were sorted in the field (Figure 9) and identified to the lowest practical taxon in the laboratory. Species abundance, number of species, and diversity of each replicate were recorded. Benthic macroinvertebrate species abundance, richness, diversity, trophic composition, and pollution tolerance for all stations is provided in Table 15. Raw benthic macroinvertebrate data and statistical summary appear in Appendices F and G.



Figure 9. Sorting benthic samples in the field.

Table 15. Benthic macroinvertebrate species abundance, richness, diversity, trophic composition, and pollution tolerance.

Speci	ies Abundance					Sta	tion					Stations 3, 4, 5	Reference
Order/Class	Species/Taxa	1	2	3	4	5	6	7	8	9	10	and 6	Stations
Oligochaeta	Oligochaete A	8	159	172	15	126	68	38	19	48	18	381	290
	Oligochaete B					19	3	4	4			22	8
Insecta	Odonata-Gomphidae	1											1
	Diptera-Chironomidae	41	70	38	13	46	85	15	19	2	19	182	166
Crustacea	Isopoda-Anthuridae		1								4		5
	Amphipod-Gammaridae	7							1				8
Bivalvia	Asian clam	50	21	12	1	11	2	1	5	4	6	26	87
Divaivia	Unionidae	4	2										6
Hirudinea L	Leech	2	3	3		1						4	5
	Total	113	256	225	29	203	158	58	48	54	47	615	576
	Species Richness												
	(total species/taxa)	7	6	4	3	5	4	4	5	3	4	5	9
	Shannon-Weaver Diversity Index												
	(mean of station replicates)	0.526	0.414	0.372	0.284	0.420	0.325	0.332	0.526	0.162	0.462	0.409	0.522
	Trophic Composition												
	% deposit feeders	49.6	89.8	93.3	96.6	94.1	98.7	98.3	89.6	92.6	87.2	95.1	82.8
	% filter feeders	47.8	9.0	5.3	3.4	5.4	1.3	1.7	10.4	7.4	12.8	4.2	16.1
	% carnivores	2.7	1.2	1.3	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.7	1.0
	Pollution Tolerance												
	% tolerant	89.4	98.8	100	100	100	100	100	97.9	100	91.5	100	96.5
	% moderately tolerant	9.7	1.2	0	0	0	0	0	2.1	0	8.5	0	3.3
	% sensitive	0.9	0	0	0	0	0	0	0	0	0	0	0.2

Species Richness and Diversity

Overall, nine benthic macroinvertebrate taxa were collected from the sediments of the 10 stations in the study area. All macroinvertebrates collected during this study are typically found in freshwater, with the exception of the isopod, which generally occurs in brackish or marine habitats. Five taxa were collected at stations adjacent to the site (Stations 3, 4, 5, and 6), while nine taxa were collected at the reference stations.

Macroinvertebrate diversity in both Hessian Run and Woodbury Creek was fairly low, with Oligochaetes, Chironomids, and the Asian clam comprising over 97% (1,162 of 1,191) of the individuals collected. Low numbers of five additional taxa (29 individuals in all) were collected: Gomphidae, Anthuridae, Gammaridae, Unionidae and Hirudinea. Macroinvertebrate diversity at stations in Hessian Run, as measured by the Shannon-Weaver Diversity Index, was generally in the range of that of Woodbury Creek stations. However, overall diversity of the stations adjacent to the Site (Stations 3, 4, 5, and 6) was lower than that of the reference stations in Hessian Run and Woodbury Creek. The mean macroinvertebrate diversity index at Stations 3, 4, 5, and 6 was 0.409, while the mean diversity of the reference sites upstream and downstream in Hessian Run and in Woodbury Creek was slightly higher at 0.522.

Trophic Composition

The trophic composition of the macroinvertebrate communities at stations in Hessian Run and Woodbury Creek are provided in Table 15. Trophic compositions are based on the percentage of individuals which are either deposit feeders (Oligochaetes, Chironomids, Anthurids, and Gammarids), filter feeders (Asian clam and Unionidae), or camivores (Gomphidae and Hirudinea). Because of the dominance of Oligochaetes and Chironomids in the benthic macroinvertebrate communities of the study area, deposit feeders dominate these communities. The macroinvertebrate communities at Stations 3, 4, 5, and 6 in Hessian Run adjacent to the Site consisted almost entirely of deposit feeders (95%), with few filter feeders (4%) or camivores (less than 1%). Macroinvertebrate communities at the reference stations in Hessian Run and Woodbury Creek also consisted primarily of deposit feeders (83%) and contained few camivores (1%), but had considerably more filter feeders (16%) than Stations 3, 4, 5, and 6. As presented in Table 15, most of these fiher feeders were collected at Stations 1 and 2, where the sediments were sandier than most/other stations sampled in the study area, likely accounting for the higher numbers of juvenile clams.

Pollution Tolerance

The Rapid Bioassessment Protocol procedure used by NJDEP's Bureau of Freshwater and Biological Monitoring is based on the USEPA's Rapid Bioassessment Protocols for use in Streams and Wadeable Rivers (EPA 841-B-99-002 Nov. 1999) This procedure involves the use of a net to collect insects, mollusks, and crustaceans in stream bottoms. The data analysis scheme calculates an impairment score based on five metrics, two of which are measures of the abundance of EPT taxa (Ephemeroptera, Plecoptera, and Trichoptera, commonly known as mayflies, stoneflies, and caddisflies) which are pollution sensitive. Because of the tidal nature of the study area and the predominance of silty sediments in the streambeds, macroinvertebrates in the study area are generally infauna which cannot be collected by net. Additionally, no EPT taxa were found in the macroinvertebrate communities of the study area. Therefore, the USEPA protocol is not appropriate to characterize the health of tidal streams with soft bottoms as those encountered during this study.

No single document was found which rated the pollution tolerance of the various macroinvertebrate taxa observed in the study area, however, several reports were used to develop estimations of relative tolerance by each taxa. These sources include Gosner (1977), USDA (1999), and USEPA (1990). Pollution tolerance, as shown in Table 15, is based on the assumption that Oligochaetes, the Asian clam, and Hirudinea are tolerant; Unionidae, Anthuridae and Gammaridae are moderately tolerant; and Gomphidae are sensitive to pollution. The macroinvertebrate communities at Stations 3, 4, 5, and 6 were entirely composed of tolerant organisms. The communities of reference stations upstream and downstream in Hessian Run and in Woodbury Creek were composed primarily of tolerant taxa (96.5%), but also contained some moderately tolerant taxa (3.3%) and a single sensitive individual.

5.0 TISSUE ANALYSIS

hn order to assess the potential for food chain bioavailability and bioaccumulation of lead and PCBs from the project site, Berger conducted tissue analysis on specimens representing various trophic levels within the study area. Four components were analyzed: fish tissue (two trophic levels), wetland vegetation tissue (two species), benthic invertebrate tissue from wetland soils, and invertebrate tissue from upland soils. Approximately 20 - 50 grams of tissue of each species were collected per replicate from each station for tissue analysis.

5.1 Fish Tissue

Berger conducted tissue analysis on *F. diaphanus* (whole fish) for ecological risk assessment. Three replicate samples were collected at each of three on-site stations (Stations 3, 4, and 5) and three replicates were collected from each of three stations located within Woodbury Creek (Stations 8, 9, and 10). The pumpkinseed, *Lepomis gibbosus*, a fish consumed by humans, provided tissue for assessment of risk to human health, although due to the small size of the individuals caught, it was not possible to sample edible portions of this species, so whole fish were analyzed. Additionally, very few *L. gibbosus* were caught in Hessian Run (only one tissue sample was collected at Station 4) and at Station 9 in Woodbury Creek. Tables 16 and 17 present the concentrations of lead and several PCB congeners found in the tissue of *F. diaphanus* and *L. gibbosus* in the study area. No disease or anomalies were observed among fish submitted for tissue collection, but it was noted that some larger *F. diaphanus* and *F. heteroclitus* individuals had red lesions around the mouths or gills. At the request of NJDEP, a single sample comprised of *F. heteroclitus* individuals affected by lesions was submitted for tissue sampling (see Table 18). Additionally, a sample of live *F. heteroclitus* bearing lesions was submitted to NJDEP fish pathologists for their examination; the results are provided in Appendix H.

Table 16. Concentrations of lead and PCB congeners in tissue of Fundulus diaphanus.

	s diaphanus	382				nants (p	om)		
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 12 3 2	Aroclor 12 4 2	Aroclor 12 48	Aroclor 125 4	Aroclor 12 6 0
	3F1	1.5	0.015U	0.015U	0.015U	0.015U	0.036	0.19	0.067
3	3 F 2	1.6	0.015U	0.015U	0.015U	0.015U	0.0 3 2	0.17	0.061
	3F3	1.6	0.025U	0.025U	0.025U	0.025U	0.0 43J	0.25	0.087
	4F1F	0.78	0.05U	0.05U	0.05U	0.05U	0.1J	0. 38J	0.13
4	4F2F	0.78	0.025U	0.025U	0.025U	0.025U	0.0 68J	0. 3 J	0.16
	4F3F	0.7	0.025U	0.025U	0.025U	0.025U	0.05 6	0.2 4J _	0. 11J
	5 F1F	0.99	0.05U	0.05U	0.05U	0.05U	0.074	0. 44J	0.16
5	5 F2F	1.2	0.05U	0.05U	0.05U	0.05U	0.069	0.39	0.16
	5 F3F	0.82	0.025U	0.025U	0.025U	0.025U	0.09	0.26	0.075
	8F1	0.7	0.025U	0.025U	0.025U	0.025U	0.05 3	0. 18J	0.091
8	8F2	0.71	0.015U	0.015U	0.015U	0.015U	0.038	0. 12J	0.0 78J
	8F3	0. 69	0.025U	0.025U	0.025U	0.025U	0.05 3	0. 19J	0. 11J
	9F1	0. 8 5	0.025U	0.025U	0.025U	0.025U	0.062	0.26	0.097
<u> </u>	9F2	0. 86	0.02 <u>5</u> U	0.025U	0.02 <u>5</u> U	0.025U	0.05 7J	0. 17J	0.1J
	9F3	1.4	0.015U	0.015U	0.015U	0.015U	0.048	0. 14J	0.078
	10 F1	0.37	0.05U	0.05U	0.05U	0.05U	0.075	0.3	0. 18
:10,	10 F 2	0.46	0.025U	0.025U	0.025U	0.025U	0.071	0.2 4J	0.14
	10 F3	0.39	0.025U	0.025U	0.025U	0.025U	0.0 61	0.2 4J	0.14

U = not detected above the sample quantitation limit (SQL)

Bolded values indicate positive detections

Table 17. Concentrations of lead and PCB congeners in tissue of Lepomis gibbosus.

<i>⊮ L</i> epomis (gibbosus			Co	ontamina	nts (ppm	i)%		
Location	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 12 3 2	Aroclor 12 4 2	Aroclor 12 48	Aroclor 125 4	Aroclor 12 6 0
Hessian	4F1L	0.6	0.025U	0.025U	0.025U	0.025U	0.081	0.2 4J	0.12
Run	4F2L -	0.52	0.015U	0.015U	0.015U	0.015U	0.068	0. 14J	0.0 69
(Station 4)	4F3L	0.47	0.05U	0.05U	0.05U	0.05U	0.1	0.2 7J	0.2 9J
Woodbury	9F1L	0.17J	0.01U	0.01U	0.01U	0.01U	0.0 3 5	0.12	0.072
Creek	9F2L •	0.28	0.025U	0.025U	0.025U	0.025U	0.11	0.28	0.0 9 2
(Station 9)	:₹9F3L*÷	0.61	0.025U	0.025U	0.025U	0.025U	0.082	0.2	0.076

U = not detected above the sample quantitation limit (SQL)

Bolded values Indicate positive detections

J = Estimated concentration

J = Estimated concentration

Table 18. Concentrations of lead and PCB congeners in tissue of *Fundulus heteroclitus* with lesions around the mouth or gills.

Fundulus h	eteroclitus	Contaminants (ppm)								
Location Sample ID		Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	
Hessian Run	HRF	0.56	0.025U	0.025U	0.025U	0.025U	0.079	0.18	0.068	

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

As depicted in Figure 10, concentrations of lead detected in *Fundulus diaphanus* from stations in Hessian Run adjacent to the Site and from Woodbury Creek reference stations were similar, with mean concentrations ranging from approximately 0.5 to 1.5 ppm. Concentrations of the three PCBs detected in *Fundulus diaphanus* from stations in Hessian Run adjacent to the Site and from Woodbury Creek reference stations were also similar, with mean concentrations ranging from approximately 0.05 to 0.35 ppm.

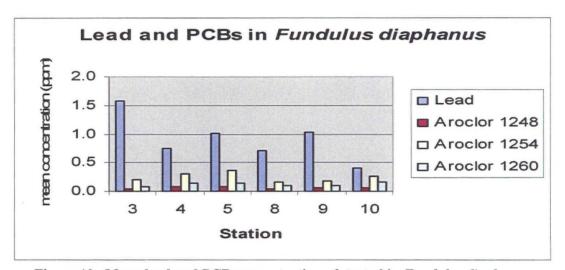


Figure 10. Mean lead and PCB concentrations detected in Fundulus diaphanus.

Figure 11 depicts the mean lead and PCB concentrations detected in *Fundulus heteroclitus* and *Lepomis gibbosus* in the study area. Concentrations of both lead and PCBs detected in *Fundulus heteroclitus* in Hessian Run adjacent to the Site were less than 0.6 ppm. These values are in the range of concentrations of these contaminants found in *Fundulus diaphanus* in both Hessian Run and Woodbury Creek. Concentrations of lead and PCBs detected in *Lepomis gibbosus* in Hessian Run adjacent to the Site were also low, and were similar to concentrations found in this species in Woodbury Creek, with mean concentrations ranging from approximately 0.1 to 0.5 ppm.

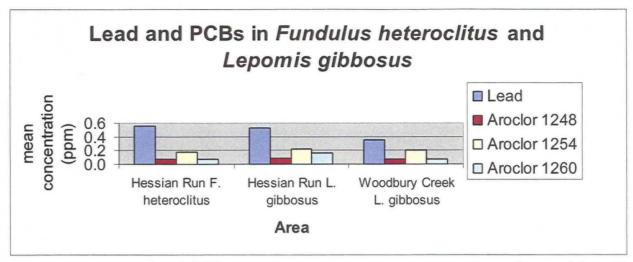


Figure 11. Mean lead and PCB concentrations detected in Fundulus heteroclitus and Lepomis gibbosus in the study area.

While lead and three PCB congeners were detected in fish species of different trophic levels at both the reference stations and stations in Hessian Run adjacent to the Site, the concentrations of these contaminants were less than 1 ppm. Concentrations of these contaminants in fish tissue at reference stations and stations adjacent to the Site were similar. Because Hessian Run drains almost completely at low tide, most fish caught there are probably transients and thus are not exposed to potential contaminants for significant periods.

Growth of juvenile brook trout (the same trophic level as *Lepomis gibbosus*) was not affected by whole-body tissue concentrations of lead ranging from of 2.5 to 5.1 ppm (Jarvinen and Ankley 1999). These reported no-effect values are several times higher than those observed in *L. gibbosus* in the study area (less than 1 ppm), so no effects on growth are expected as a result of lead contamination from the site. No published data were available to compare tissue lead concentrations of fish from the same trophic level as *Fundulus diaphanus*, but the observed concentrations were also lower than the no-effect level reported for brook trout.

Most PCB contamination studies in fish have focused on the effects of Aroclor 1254. Survival and growth of juvenile rainbow trout was not affected by whole-body tissue concentrations of Aroclor 1254 of 81 ppm (Jarvinen and Ankley 1999). This reported no-effect value for Aroclor 1254 is much higher than those observed in *L. gibbosus* in the study area (less than 1 ppm). Aroclor 1248 and 1260 were detected in *L. gibbosus* in the study area in similarly low concentrations, so no effects on growth are expected as a result of contamination from these PCBs from the site.

Survival and growth of adult fathead minnows (the same trophic level as *F. diaphanus*) was not affected by whole-body tissue concentrations of Aroclor 1254 ranging from 741 to 1253 ppm (Jarvinen and Ankley 1999). These reported no-effect values for Aroclor 1254 are much higher than those observed in *F. diaphanus* in the study area (less than 1 ppm). Aroclor 1248 and 1260 were detected in *F. diaphanus* in the study area in similarly low concentrations, so no effects on survival or growth are expected as a result of contamination from these PCBs from the site.

The USEPA has established guidance for assessing chemical contaminant data for use in fish advisories (USEPA 2000). This guidance does not include screening for lead. The PCB screening in the guidance is for total PCBs. This study investigated fish tissue contamination of seven PCB congeners, but total PCB concentrations in fish tissue were not measured. Additionally, the screening is based on edible portions,

which were not obtained during the study due to the small size of the fish caught. Because of this, our data are not directly comparable with the EPA screening guidance.

The mean combined concentrations of Aroclor 1248, 1254, and 1260 in whole-body tissue of *L. gibbosus* in Hessian Run was 0.459 ppm, and in Woodbury Creek it was 0.356 ppm. USEPA's fish consumption guidance for noncancer health endpoints recommends that fish tissue with total PCB concentrations exceeding 0.38 ppm should not be consumed (fish meals per month=none (less than 0.5)). For cancer health endpoints, the guidance recommends that there should be no consumption of fish tissue with total PCB concentrations exceeding 0.094 ppm (fish meals per month=none (less than 0.5)). Whole-body tissue of *L. gibbosus* in both Hessian Run and Woodbury Creek exceeded both USEPA's noncancer and cancer health endpoints for any fish consumption.

5.2 Benthic Macroinvertebrate Tissue

Berger conducted benthic macroinvertebrate tissue analysis on the Asian clam (*Corbicula fluminea*) for ecological risk assessment. Three replicate samples were collected at each of three on-site stations (Stations 3, 4, and 5) and three replicates were collected from each of three stations located within Woodbury Creek (Stations 8, 9, and 10). Asian clams were collected from the substrate with the use of a rake and sieve with ¼ inch mesh (Figure 12). As each clam contained approximately 0.08 g of tissue, 250 clams were collected per sample in order to collect the minimum target sample of 20 g. Table 19 presents the concentrations of lead and several PCB congeners found in the tissue of the Asian clam in the study area.



Figure 12. Collecting Asian clams for tissue contaminant analysis.

As depicted in Figure 13, concentrations of lead detected in the Asian clam at stations in Hessian Run adjacent to the Site and from Woodbury Creek reference stations were similar, with mean concentrations ranging from approximately 0.4 to 0.9 ppm. Concentrations of the three PCB congeners detected in the Asian clam were also similar at stations in Hessian Run and Woodbury Creek, with mean concentrations of less than 0.3 ppm. While the Asian clam is truly a resident of stations adjacent to the Site, it feeds on plankton transported by the tide which are not exposed to potential on-Site contaminants present in the sediment, and as such, the clam's tissues have low concentrations of these contaminants.

Table 19. Concentrations of lead and PCB congeners in tissue of the Asian clam.

Asian	Clam				Contami	inant (pp	m)		
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
	3B1	0.79	0.025U	0.025U	0.025U	0.025U	0.066J	0.19	0.032J
3	3B2	0.54	0.025U	0.025U	0.025U	0.025U	0.07	0.19	0.025U
	3B3	0.44	0.025U	0.025U	0.025U	0.025U	0.078	0.22	0.026
	4B1	0.78	0.025U	0.025U	0.025U	0.025U	0.084	0.23	0.029
4	4B2	0.73	0.025U	0.025U	0.025U	0.025U	0.1	0.26	0.033
	4B3	0.91	0.025U	0.025U	0.025U	0.025U	0.1	0.26	0.036
5	5B1	0.52	0.025U	0.025U	0.025U	0.025U	0.072	0.2	0.026
	5B2	0.53	0.025U	0.025U	0.025U	0.025U	0.062	0.18	0.02500
	5B3	0.59	0.025U	0.025U	0.025U	0.025U	0.066	0.18	0.02500
	8B1	1.3	0.025U	0.025U	0.025U	0.025U	0.041J	0.12	0.025U
8	8B2	0.57	0.015U	0.015U	0.015U	0.015U	0.034J	0.093	0.021
	8B3	0.92	0.015U	0.015U	0.015U	0.015U	0.035J	0.1	0.021
	9B1	0.38	0.01U	0.01U	0.01U	0.01U	0.029	0.082	0.013
9	9B2	0.46	0.015U	0.015U	0.015U	0.015U	0.047	0.14	0.022
	9B3	0.5	0.015U	0.015U	0.015U	0.015U	0.048	0.14J	0.024
	10B1	0.86	0.025U	0.025U	0.025U	0.025U	0.046J	0.13	0.032
10	10B2	0.56	0.025U	0.025U	0.025U	0.025U	0.047J	0.13	0.027J
	10B3	1	0.015U	0.015U	0.015U	0.015U	0.03J	0.091	0.025J

U = not detected above the sample quantitation limit (SQL)

Bolded values indicate positive detections

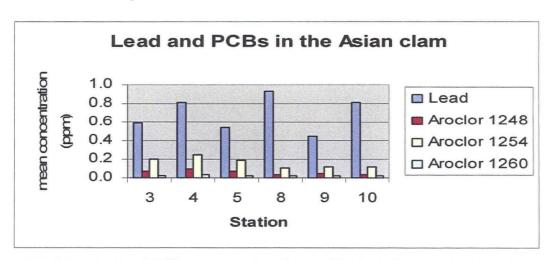


Figure 13. Mean lead and PCB concentrations detected in the Asian clam in the study area.

5.3 Upland Invertebrate Tissue

Berger collected three replicate earthworm (*Lumbricus* spp.) samples from three stations within upland soil on the project site and one off-site reference station for ecological risk assessment. The sample

J = Estimated concentration

station locations are depicted on Figure 1. Earthworm samples were collected using shovels. Upon collection, earthworms were rinsed with distilled water to remove associated soil particles. In the laboratory, the whole earthworms were homogenized and sampled for the contaminants of concern. Earthworms were not dissected and no depuration of earthworm guts was undertaken.



Figure 14. Taking position of earthworm collection site with GPS.

Table 20 shows the concentrations of lead and several PCB congeners found in the tissue of earthworms in the study area. No disease or anomalies were observed among earthworms.

Table 20. Concentrations of lead and PCB congeners in earthworm tissue.

Ear	rthworm				Contami	nant (ppn	n)		
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
	4E1	441	0.50U	0.50U	0.50U	0.50U	0.50U	2.9	3.1
4E	4E2	400	0.50U	0.50U	0.50U	0.50U	0.50U	2.4	2.4J
	4E3	511	0.50U	0.50U	0.50U	0.50U	0.50U	2.1	3.2J
	4.5E1	339	0.50U	0.50U	0.50U	0.50U	0.50U	0.50U 3.5 0.50U 2.5	5.6
4.5E	4.5E 4.5E2		0.50U	0.50U	0.50U	0.50U	0.50U	2.5	4
	4.5E3	414	0.50U	0.50U	0.50U	0.50U	0.50U	2.5	3.2
	5E1	1,090	0.075U	0.075U	0.075U	0.075U	0.075U	0.62	0.37
5E	5E2	1,150	0.10U	0.10U	0.10U	0.10U	0.10U	0.69	0.37
	5E3	1,100	0.10U	0.10U	0.10U	0.10U	0.10U	0.73	0.36
	8E1	4.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.005U
8E	8E2	25.1	0.025U	0.025U	0.025U	0.025U	0.025U	0.12J	0.025U
	8E3	5.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.014	0.005U

U = not detected above the Sample Quanitation Limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

Figure 15 depicts the mean lead concentrations detected in earthworm tissue within the study area. Mean concentrations of lead detected in earthworm tissue at on-Site stations ranged from approximately 340 to 1,100 ppm, while the mean concentration at the reference station was only 12 ppm. Figure 16 depicts the mean PCB concentrations in earthworm tissue within the study area. Mean concentrations of the two PCB congeners detected in earthworms at on-Site stations ranged from approximately 0.4 to 4 ppm, while only one of these congeners was detected in earthworms at the reference station, and at a much lower mean concentration of about 0.05 ppm. Lead was detected in earthworms at the on-Site stations in mean concentrations 20 times greater than that of the reference station. PCBs were detected in earthworms at the on-Site stations in mean concentrations eight times greater than that of the reference station.

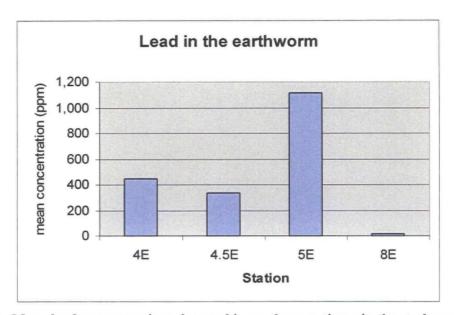


Figure 15. Mean lead concentrations detected in earthworm tissue in the study area.

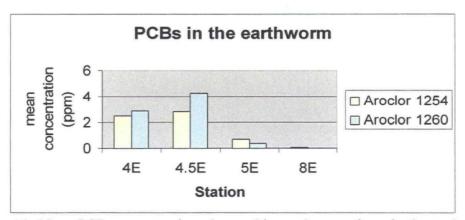


Figure 16. Mean PCB concentrations detected in earthworm tissue in the study area.

Soil samples were not collected for analysis at the time of this study's earthworm sampling event, however, eight soil samples were collected and analyzed for lead from test pits during the previous RI investigations in the vicinity of the earthworm sampling Stations 4E, 4.5E and 5E. Those eight soil samples were collected at depths ranging from 0–3 feet bgs, and exhibited elevated lead concentrations ranging from a minimum of 821ppm to a maximum of 31,300, and the mean lead concentration was 11,600ppm. All of these lead contaminated soil samples were collected in areas containing observed

buried and surface battery casings and other mixed waste materials, as were the earthworm tissue samples exhibiting elevated lead and PCB concentrations at Stations 4E, 4.5E and 5E. Although no previous soil samples had been collected near earthworm Station 8E (which exhibited much lower lead and PCB concentrations), no battery casings or other mixed waste were observed at this location. Since lead and PCB concentrations in earthworm tissue were reported high in areas containing battery casings or other mixed waste, and much lower where waste was not observed, there appears to be a direct correlation between lead in earthworms and the presence or absence of site related waste materials. Although the previous RI soil samples collected near the earthworm tissue stations were not analyzed for PCBs, the same correlation can be drawn between the observed presence or absence of waste and elevated PCBs concentrations in tissue.

5.4 Wetland Plant Tissue

Berger conducted tissue analyses on the wetland plants wild rice (*Zizania aquatica*) and spatterdock (*Nuphar luteum*), which were common in Hessian Run and along the shorelines of Woodbury Creek. Three replicate samples of each species were collected at each of three on-site stations in Hessian Run (Stations 4, 5 and 6) and at one reference station within Woodbury Creek (Station 8). For both spatterdock and wild rice, the tissue collection consisted of above-ground portions of vegetation. Careful attention during the field collection process ensured that only vegetation which was free of sediment was collected. Spatterdock samples were composed of stems and leaves, while wild rice samples consisted of stems, leaves, and seedheads.

Tables 21 and 22 show the concentrations of lead and several PCB congeners found in the tissue of wild rice and spatterdock in the study area.

Table 21. Concentrations of lead and PCB congeners in tissue of the wetland plant spatterdock.

Spa	tterdock				Contami	nant (ppr	n)		
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
	4PN1	9.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.015J	0.0083
4	4PN2	4.8	0.005U	0.005U	0.005U	0.005U	0.005U	0.0095J	0.005U
	4PN3	5.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.0053
	5PN1	8.4	0.005U	0.005U	0.005U	0.005U	0.005U	0.015J	0.008
5	5PN2	6.7	0.005U	0.005U	0.005U	0.005U	0.005U	0.014J	0.0076
	5PN3	7.6	0.005U	0.005U	0.005U	0.005U	0.005U	0.013J	0.0058
	6PN1	4.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.0088J	0.005U
6	6PN2	5.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.01J	0.0051
	6PN3	3.9	0.005U	0.005U	0.005U	0.005U	0.005U	0.0094J	0.005U
	8PN1	1.5	0.005U						
8	8PN2	1.4	0.005U						
	8PN3	1.6	0.005U	0.005U	0.005U	0.005U	0.027	0.005U	0.005U

U = not detected above the sample quantitation limit (SQL)

J = Estimated concentration

Bolded values indicate positive detections

Table 22. Concentrations of lead and PCB congeners in tissue of the wetland plant wild rice.

Wild	Rice				Contam	inant (pp	m)		
Station	Sample ID	Lead	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
	4PZ1	2.2	0.005U						
	4PZ2	6.1	0.005U	0.005U	0.005U	0.005U	0.005U	0.007J	0.005U
	4PZ3	5.6	0.005U	0.005U	0.005U	0.005U	0.005U	0.0052J	0.005U
5	5PZ1	1.3	0.005U						
	5PZ2	3.5	0.005U	0.005U	0.005U	0.005U	0.005U	0.0062	0.005U
	5PZ3	1.8	0.005U						
	6PZ1	8.2	0.005U	0.005U	0.005U	0.005U	0.005U	0.012J	0.0073J
6	6PZ2	6	0.005U	0.005U	0.005U	0.005U	0.005U	0.0084J	0.005U
	6PZ3	7.1	0.005U	0.005U	0.005U	0.005U	0.005U	0.014J	0.0074J
	8PZ1	0.33	0.005U						
8	8PZ2	0.36	0.005U						
5	8PZ3	0.23J	0.005U						

U = not detected above the sample quantitation limit (SQL)

Bolded values indicate positive detections

J = Estimated concentration

Both lead and PCBs were detected in the two wetland plant species at stations adjacent to the Site. Figure 17 depicts mean lead concentrations detected in wetland plants in the study area. Mean concentrations of lead detected in the wetland plants spatterdock and wild rice at stations in Hessian Run adjacent to the Site ranged from approximately 2 to 7 ppm, while the mean concentrations in these plants at the Woodbury Creek reference station were less than 2 ppm. Figures 18 and 19 depict mean PCB concentrations in spatterdock and wild rice in the study area. Mean concentrations of the two PCB congeners detected in these two wetland plants at stations in Hessian Run adjacent to the Site ranged from approximately 0.005 to 0.015 ppm, while neither of these two congeners was detected in the tissue of these plant species at the Woodbury Creek reference station.

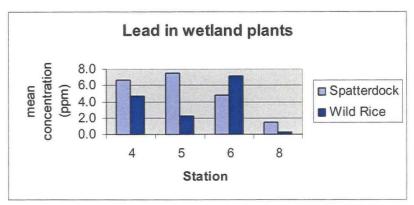


Figure 17. Mean lead concentrations detected in wetland plants in the study area.

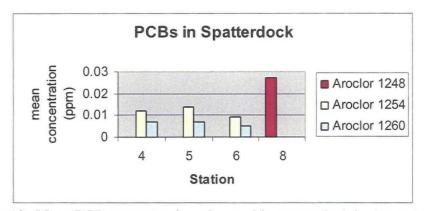


Figure 18. Mean PCB concentrations detected in spatterdock in the study area.

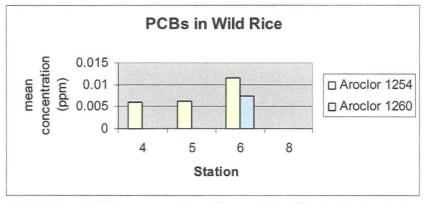


Figure 19. Mean PCB concentrations detected in wild rice in the study area.

6.0 CONCLUSIONS

The dissolved oxygen levels and pH of surface water at Site stations (Stations 3, 4, 5, & 6) in Hessian Run met the state criteria for FW2 waters. Concentrations of total recoverable lead at all Site stations were below the acute aquatic life protection standard, but three of the four Site stations (3, 5, and 6) exceeded the chronic aquatic life protection criteria. Sediment sampling revealed that concentrations of lead in sediments at all Site stations were greater than lead concentrations at all reference stations. Sediment lead concentrations exceeded the Lowest Effects Level (LEL) at all Site stations, and lead concentrations at three of four Site stations (3, 4, and 6) also exceeded the Severe Effects Level (SEL). While lead concentrations at station 6 only slightly exceeded the SEL, lead concentrations at stations 3 and 4, respectively, greatly exceeded the SEL by 1 to 1.75 orders of magnitude. Based on results presented in the recent Remedial Investigation Report (RIR - Berger, 2004), the locations of stations 3 and 4 coincide with those of the heaviest concentrations of lead bearing battery casings previously deposited along the Hessian Run shoreline. Concentrations of Aroclor 1254 and Aroclor 1260 detected at all four Site stations exceeded the LEL, but did not exceed the SEL. Concentrations of these two PCB congeners at Site Station 4 were approximately ten times higher than concentrations detected at all other stations. Site Station 4 also contained another PCB that was not detected at any other station in the study area.

Sediment toxicity testing through acute exposure experiments indicated elevated toxicity of some Site station sediments relative to reference stations and control sediment. Sediments from Station 4 resulted in 100% mortality of amphipod test organisms, while Site Station 6 had significantly less test organism survival than the control sediment. Survival and growth at the other two Site stations (3 and 5) were not significantly different than survival in the control sediment. In the midge testing, sediment from Site Station 4 again resulted in 100% mortality of test organisms, while the other three Site stations all had significantly less test organism survival than control sediment. In both the amphipod and midge testing, several of the reference sites also had significantly less survival than control sediment. Chronic exposure experiments using larval midges as test organisms resulted in significantly less adult emergence at three of the four Site stations than the reference stations. Site Station 3 also had a significantly greater number of days before first emergence than the reference stations.

Four fish species were caught at Site stations, while twelve species were caught at the reference stations. Mean fish diversity at the four Site stations was considerably lower than at the six reference stations upstream and downstream in Hessian Run and in Woodbury Creek. The fish communities at the Site stations consisted almost entirely of omnivores, whereas fish communities at the reference stations, while also primarily composed of omnivores, had a greater percentage of water-column feeders and top carnivores. In addition, three species not encountered in a 1977 fish survey of the study area (Hastings and Good, 1977) were caught during this study.

Five benthic macroinvertebrate taxa were collected at the Site stations, while nine taxa were collected at the reference stations. Mean taxa diversity of the Site stations was slightly lower than that of the reference stations. The benthic macroinvertebrate communities at the Site stations and reference stations consisted almost entirely of deposit feeders, with few filter feeders or carnivores. Benthic taxa at the reference stations were primarily pollution-tolerant, but some moderately tolerant and sensitive taxa were present, while Site stations consisted entirely of pollution-tolerant organisms.

Similar concentrations of lead were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations. PCBs were detected in fish and clam tissue from Site stations and Woodbury Creek reference stations at similar concentrations. Concentrations of lead detected in the wetland plants spatterdock and wild rice at Site stations were considerably higher that those of the Woodbury Creek

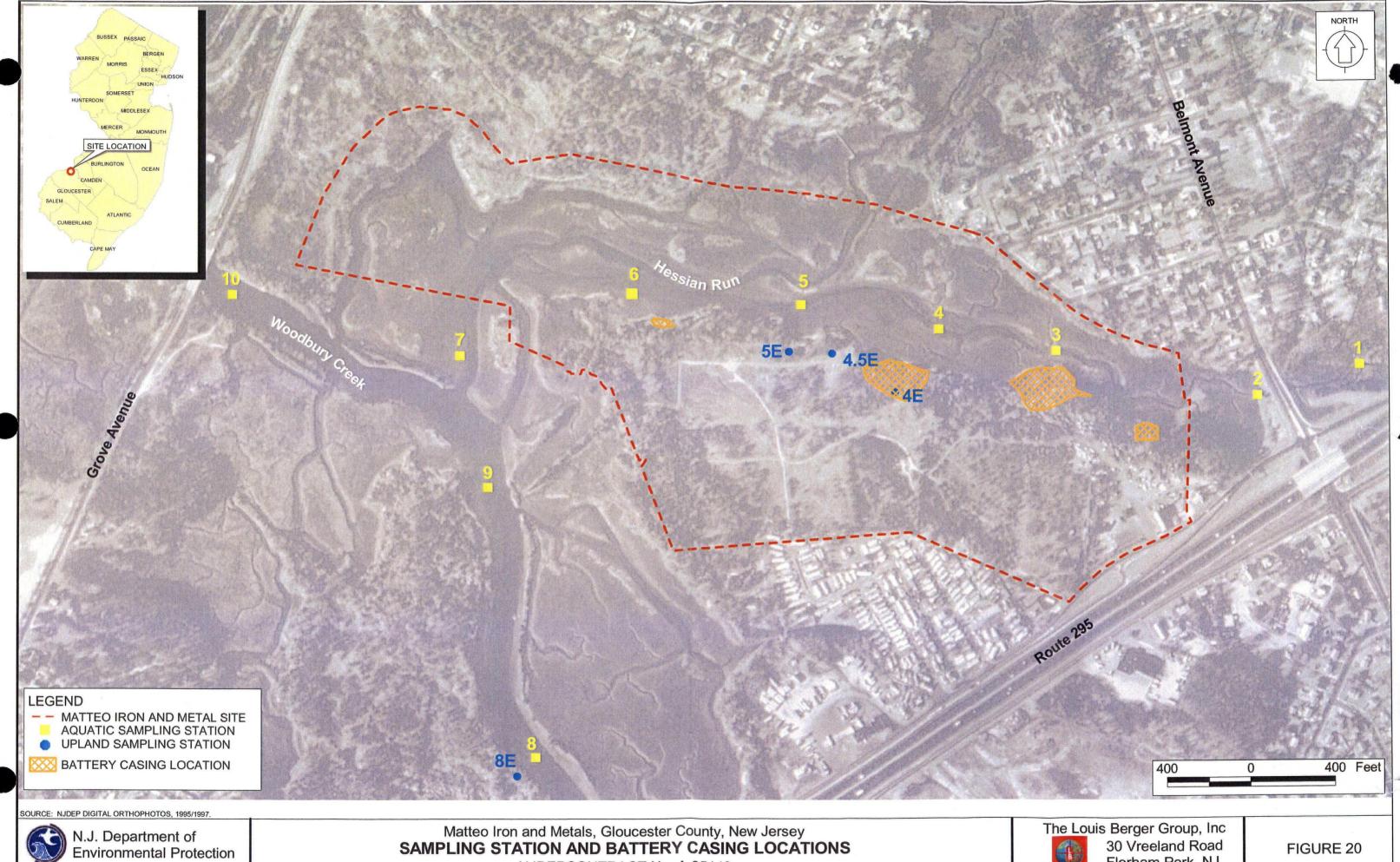
reference stations. Concentrations of two PCB congeners (Aroclor 1254 and Aroclor 1260) detected in these plant species at Site stations were also considerably higher than at the reference stations. In earthworm tissue, lead concentrations at the Site stations were over ten times greater than at the reference station. Concentrations of the two PCB congeners detected in earthworms at Site stations were also much higher than at the reference station.

In summary, concentrations of total recoverable lead in surface water samples at three of the four Site stations (3, 5, and 6) exceeded NJDEP's chronic aquatic life protection criteria. Sediment lead concentrations at three of the four Site stations (3, 4, and 6) exceeded NJDEP's SEL values. Sediments at Site Stations 3 and 4, which both had sediment lead concentrations of over 2,000 ppm, exhibited high benthic organism toxicity relative to other stations in the study area; station 4 exhibited the highest mortality rate (100% mortality) for both amphipods and midges. These two stations with high lead concentrations and toxicity levels are located immediately adjacent to the heaviest concentrations of shoreline battery casing deposits (see Figure 20). As evidenced by the field assessment results, benthic organisms do occur in the sediment at Site Stations 3, 4, 5, and 6, albeit at lower diversity than the reference stations. However, benthic organisms in fine-grained sediment such as that present in the study area typically occur within the top few centimeters of sediment. Because the sediment used for sediment contaminant sampling and sediment toxicity testing was collected from a composited depth of 0-6", the deeper portion of the sample may contain contaminant levels toxic to the benthos. Consequently, disturbance and exposure of deeper sediment containing high levels of contaminants would adversely impact the aquatic biota.

Concentrations of lead and PCBs in fish and clam tissue were similar at the Site and reference stations. This result is not unexpected, considering the natural history of the organisms. Fish are mobile and unlike the benthos, are not resident at a particular station. Therefore, they would not be exposed exclusively to water and sediment quality conditions at a particular site. The clams are resident members of the benthic community, but are filter feeders. In addition, the relatively small size of the clams that were collected and analyzed indicates that the individuals represented a newly settled year class.

Lead and PCB concentrations in wetland plant tissue were much higher at the Site stations than the reference stations, suggesting that pollutants may be located more deeply in the sediment where plant roots can uptake them. Herbivores inhabiting this area would appear to be at risk of consuming plants with elevated concentrations of pollutants.

Earthworm tissue lead and PCB concentrations were much greater at the three upland Site stations (Stations 4E, 4.5E & 5E) than the off-site reference station (8E). The three lead and PCB impacted upland sampling stations were located within areas documented in the RIR (Berger, 2004) to contain surficial and buried mixed waste materials containing lead bearing battery casings and PCB contaminated soils. Earthworms are a major food source for shrews and moles, as well as a variety of bird species, and may represent a pathway through which lead and PCBs are passed onto higher trophic levels in the food chain.



Matteo Iron and Metals, Gloucester County, New Jersey
SAMPLING STATION AND BATTERY CASING LOCATIONS NJDEPCONTRACT No. A-85149

30 Vreeland Road Florham Park, NJ

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Bearment toxicity test	ing - 11yutettu uzteeu	

The Louis Berger Group, Inc.

Final Aquatic Biota Study Report - Matteo Iron and Metals, West Deptford, NJ

REPORT CERTIFICATION

The following report titled "THE LOUIS BERGER GROUP, INC. MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – Hyalella azteca" is an accurate and truthful representation of the toxicity testing which was performed by American Aquatic Testing, Inc., located at 1105 Union Blvd. Allentown, Pennsylvania. We further certify that we have personally examined and are familiar with the information submitted in this document and based on our inquiry of those individuals immediately responsible for obtaining the information, we believe the submitted information is complete as presented. We are aware that there are significant penalties for submitting false information.

Christopher J. Nally

President, Laboratory Director

Tarmo Pallop

Vice-President, Laboratory Manager

APPENDIX A

THE LOUIS BERGER GROUP, INC. MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – Hyalella azteca

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Data

Raw data for Hyalella azteca 28-day survival and growth test

Statistical data for *Hyalella azteca* 28-day survival and growth test using control sediment

Chain of Custody Documentation

MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – Hyalella azteca

INTRODUCTION

During the month of August 2003, samples of sediment were collected from the Matteo Iron and Metals facility and stirrounding area in Gloucester County, New Jersey. These sediment samples were used to perform toxicity tests to determine if the tested matrices represent a significant threat to potential receptor organisms.

The sediment samples from the study area were delivered to American Aquatic Testing, Inc. (AAT) and evaluated for toxicity using a 28-day solid phase exposure with the amphipod *Hyalella azteca* [1]. Following the exposure period, surviving test organisms from the sediments collected in the study area were compared to a control set tested under similar conditions using sediment of known environmental quality. The endpoints used for determination of an impact in the amphipod exposures were mortality, measured as mean survival, and growth, measured as mean dry weight.

MATERIALS AND METHODS / Hyalella azteca

Surface sediment samples were collected at stations adjacent to the Matteo Iron and Metals facility. Station locations were selected to represent areas that may have been impacted by the facility's operations. Sediment samples were also taken at stations in the surrounding area for the purpose of making reference comparisons.

Preparation of sediment samples for testing

The sediment saniples collected on August 18, 19 and 20 2003, were transported to the Severn Trent Laboratories facility in Edison, NJ and picked up by AAT personnel on August 21, 2003. Samples were collected in 2.5-gallon high-density polyethylene (HDPE) containers and transported on ice. Upon arrival at AAT on August 21, 2003, the samples were refrigerated until being used for testing on September 3, 2003. These samples were not altered other than to remove large debris and organic material (larger than ~3 cm) before testing.

Control sediment used to assess the health of the test organisms used for testing was collected from the Spruce Run Reservoir in Clinton, NJ on August 26, 2003 and was screened on-site using a #18 mesh screen to remove large debris and indigenous organisms. Screened sediment was placed in a five gallon HDPE container for transport to the laboratory and refrigerated until used for testing on September 3, 2003. Control sediment was analyzed for grain size, and total organic carbon (TOC) by Severn Trent Laboratories in Edison, NJ. The results of these analyses are included at the end of this appendix.

Test organisms

Amphipods (*Hyalella azteca*) used for the study were obtained from stock cultures maintained by Aquatic Biosystems, Inc. of Fort Collins, CO and were received in-house on September 3, 2003. Prior to testing, the organisms were held under conditions similar to that which they would encounter during the test (see Table I). The amphipods were fed once daily a combination of yeast, cereal leaves and digested trout pellets (YCT) [1]. At the beginning of the 28-day exposure, the test organisms were 7 days old. The age group used to conduct this test did however fall within the acceptable age range for this procedure [1].

A reference toxicant test using potassium chloride was conducted concurrently with the 28-day exposure to assess the sensitivity of the lot of organisms used in the sediment test. The 48 hr LC₅₀ produced was 338.7 ppm. This test value falls within the acceptable range of the control chart being maintained by AAT for this test species. A copy of the raw data and the control chart are included.

Experimental procedures

The entire sediment exposure series for this project consisted of ten sediment samples from the study area and one of control sediment from Spruce Run Reservoir. Test chambers (300 mL tall form borosilicate glass beakers) were filled with 100 mL of sediment. 175 mL of test water was poured over the sediment gently to cause minimal disturbance. There were five replicate chambers for each station treatment. Test chambers were allowed to settle for 24 hours prior to test initiation.

After the settling period, the overlying water was siphoned off and fresh water was introduced, using a small, round HDPE disk suspended over the sediment to deflect the water flow and minimize disturbance to the sediment. Water quality data including alkalinity, ammonia, conductivity, dissolved oxygen, temperature, pH, and hardness were measured initially on composite water samples from all samples, prior to the introduction of test organisms, and at the end of the 28-day exposure for each sample and the control. Conductivity was also measured at 7, 14 and 21 days in all samples and the control. The dissolved oxygen, pH and temperature were also measured initially and every 24 hours thereafter for the duration of the exposure for each sample and the control.

The exposure period began by placing 10 randomly selected test organisms into each chamber. Care was taken to ensure that the organisms were released beneath the surface of the overlying water to keep air bubbles from forcing the organisms to the surface. Test chambers were not fed during this exposure. Test conditions are summarized in Table I.

Observations were made and recorded for each chamber each day during the exposure period to assess organism health. Observations included the number of organisms dead, swimming, on the surface of the sediment or on the surface of the water. Dissolved oxygen, pH and temperature were measured and recorded each day from a new replicate chamber for each sample and the control. During the 28 days of the test, each chamber would be used for recordings five times and three chambers would be used six times. 150 mL of the overlying water was siphoned off twice a day and replaced using reconstituted water as a measure to maintain sufficient dissolved oxygen levels. Care was taken to minimize disturbance of the sediment during water renewal by using the small HDPE disc.

At the end of the 28-day exposure the final alkalinity, ammonia, conductivity, hardness, dissolved oxygen, pH and temperature were measured, and the test chambers were prepared for the removal of test organisms. With the overlying water present in each chamber, the top 20% of sediment was gently stirred into suspension. The slurry was then poured into a #60 mesh screen (250 µm) and rinsed in a shallow pan of laboratory water to remove the finer grains of the sediment. Sediment remaining in the sieve was placed into a second shallow pan of water over a light table, and carefully sorted to find the surviving test organisms. Using additional laboratory water, this process was repeated two or three times for each replicate until all the sediment had been inspected. All surviving organisms were transferred to a 30 mL soufflé cup for live count verification and preparation for weight determination.

When all test chambers had been sieved and the number of survivors verified, the test organisms were sacrificed using ethanol. The test organisms were then placed on tared aluminum weigh pans, which had been initially dried and weighed on October 1, 2003, dried for six hours at 105°C, and then transferred to a dessicator to cool before dry weight determination. Final dry weights were recorded on October 8, 2003.

Data analysis

Data analysis was performed following procedures published by the USEPA [1] using the Toxstat [2] data analysis software. Survival data, in the form of proportion of survivors in each chamber, was transformed by arcsine squareroot and then tested for normality using the Shapiro-Wilk's test or the Chi-Square test and for homogeneity of variance using Bartlett's test, as appropriate. Analysis of variance (ANOVA) followed by Dumett's *a posteriori* pairwise comparisons or Steel's Many-One Rank test, as appropriate, to evaluate differences between stations and the control sample.

TABLE I: Summary of Conditions for Hyalella azteca Toxicity Test

1.	Test type;	Whole sediment, static, daily renewal
2.	Temperature;	23.0 +/- 1.0 ° C
3.	Light quality;	Wide-spectrum fluorescent illumination
4.	Light intensity;	50 - 100 foot-candles
5.	Photoperiod;	16 hours light, 08 hours dark
6.	Test chamber size;	300 mL high form borosilicate glass beakers
7.	Sediment volume;	100 mL / replicate
8.	Overlying water volume;	175 mL / replicate
9.	Renewal;	2 volume exchanges per day
10.	Age of test organisms;	7 days
11.	Number organisms / container;	10
12.	Replicates;	5
13.	Feeding;	None
14.	Aeration;	None unless dissolved oxygen concentrations ≤ 2.5 ppm, then ~ 100 bubbles / min.
15.	Overlying water;	Laboratory reconstituted water
16.	Test chamber cleaning;	Only if necessary
17.	Overlying water quality;	D. O., pH and temperature daily; alkalinity,
		ammonia, conductivity, hardness & pH at beginning and end of test, conductivity @ 7, 14, 21 days
18.	Test duration;	28 days
19.	Effects measured;	Survival and growth as mean dry weight
20.	Test acceptability;	Minimum control survival 80 %
		İ

RESULTS

Effects on Survival / Control Sample

Raw data are presented at the end of this Appendix. Data were arcsine square root transformed. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival of organisms in station sediments and the control sample.

Results from the analysis, which compared survival in station sediments with survival of organisms exposed to the control sample, are presented in Table II and at the end of this Appendix.

Of the ten stations in the study area, station 4 caused 100% thortality and was eliminated from analysis. Sediment from stations I, 2, 3, 5 and 8 did not produce mortality statistically different from the control exposure. Amphipods exposed to sediment from stations 6, 7, 9 and 10 had significantly less survival than those exposed to the control treatment, and were not included in weight determinations.

Table II. Percent survival of H. azteca by replicate chamber & survival comparison using control sample

					S	tation			,		
Replicate	Control	1	2	3	4*	5	6	7	8	9	10
A	100	100	100	90	0	100	100	70	100	60	90
В	90	90	100	80	0	100	70	40	100	80	60
С	100	90	100	90	0	80	60	70	90	100	80
D	100	100	90	70	:0	100	60	60	80	70	60
Е	100	100	80	90	0	80	60	40	90	70	50
Mean Survival	98.0	96.0	94.0	84.0	0	92.0	70.0	56.0	92.0	76.0	68.0
Statistically Different From Control	_	No	No	No	Yes	No	Yes	Yes	No	Yes	Yes

^{* -} Sample not included in ANOVA due to 100 % mortality

Effects on Growth / Control Sample

Raw data are presented at the end of this Appendix. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Durmett's pairwise comparisons were used to determine differences between growth of organisms in stafion sediments and the control sample.

Results from the analysis, which compared mean dry weights for stations 1, 2, 3, 5 and 8 to the control sample, are presented in Table III and at the end of this Appendix.

Of the five stations that did not exhibit excessive mortality compared to the control sample, stations 1, 2, 3 and 5 did not produce mean dry weights significantly different from the control exposure. Only station 8 was found to be statistically significant for average dry weight.

Table III. Mean dry weight (mg.) of H. azteca by replicate chamber & growth comparison using control

		· ·	Sta	tion		
Replicate	Control	1	2	3	5	8
Α	0.067	0.087	0.073	0.053	0.082	0.039
В	0.077	0.083	0.108	0.074	0.076	0.065
С	0.076	0.106	0.079	0.073	0.091	0.058
D	0.080	0.086	0.072	0.083	0.058	0.071
Е	0.079	0.101	0.075	0.081	0.069	0.050
Mean Dry Wt. – mg.	0.076	0.093	0.081	0.073	0.075	0.057
Statistically Different From Control	_	No	No	No	No	Yes

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- [2] Toxstat March, 1994 Version 3.4 data analysis software published by West, Inc. Western EcoSystems Technology, Inc., Cheyenne, WY

RAW DATA FOR *Hyalella azteca* 28-DAY SURVIVAL AND GROWTH TEST

Job Number: 173-01-01 Species: H.42teca Beginning Date & Time: 9-3-03 1720 Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, inc., Observations/Live Count

	r							D	ay						
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Site	B	B	3	B	B	B	В	B	2	7	3	ν.	μ	N	ν.
Dite	C	<u>B</u>	3	B	$\overline{\mathcal{Z}}$	a	· B	B	N	V	B	μ	Ν	N	Ν
1	D	B	8	B		B	Ř	В	N	μ	B	ν	N	10	N
-	E	B	3	Ř	2	B	B	В	N	2	B	Ρ	7	N	Λ
	A	B	3	B	B	13	B	B	N	N	B	7	ν	10	Ν
Site	В		В	B		3	8	8	N	N	R	N	ν	N	~
Ji i C	C	B B	B	Ã	3 3	B	8	B	N	N	B	N	Ν	0	N
2	D	B	8		2		В	B	N	Ν	3	N	N	N	Ν
0	E	B	B	B	B	000	8	B	N	Ν	B.	N	μ	N	N
	A	B	8		B	B	В	В	N	ν	B	7	Ν	N	N
Site	B	B	B	B	8	B	8	B	N	7	3	٧	N	N	N
	C	B	В	B	3	В	В	B	N	N	B	þ	μ	N	N
3	D	B	B				В	В	N	ν	B	μ	7	10	N
	E	8	B	B	3	B	N	. B	N	N	B	μ	P	10	N
	A	<u> </u>	В	B	3	B	В	В	N	Ν	3	Ν	μ	10	N,
Site	B	B	8	N.	8		8	B	N	7	В	N	2	0	N
, ,	C	<u> </u>	3	N	3	800	В	B	N	N	B	μ	7	N	N
9	D	3	B		23	13	В	В	N	7	3	7	N	N	<u> </u>
•	E	B	B	B	8	3	В	13	17	7	B	N	ν	N	א
Initia		TRE	780	76	C	76	W8	708?	MP	700	30	7099	100	No	789
Date		9/3	Chi.	4/-	oldo	0/7	98	9/9	9/10	9/11	9/12	9/13	9/14	5/15	9/16
Dail		'/3	<i>'/7</i> ∤	(ey: D=	dead,	N=norr	nal acti	vity, A=	abnorm	nal activ	vity, B=	No Obs	ervatio	ns	

Comments:

Job Number:	173-01-01
Species:	H.azteca

Beginning Date & Time: 9-3-3 172-3 Ending Date & Time: 10-1-3 (800)

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

											····					Da	y 28
Conc.	Rep	. 14	15	16	17	18	19	20	Day 21	22	23	24	25	26	27	Observ	Final Count
<u>- Conc.</u>	A	17	113	- N	J	165	 j	N	N	T N	12	N	N	$\frac{20}{\nu}$	N	N	io
	В	N	N	- [-	N	1,2	 'U	 '\' 	1 7	10	10	12	10	10	10	 	9
Ω	C	N	N	<u> </u>	N	10	l U	 'v	N	\	13	N	N	1	10	+ /-	10.
Contro	/ 	U	+ 15	N	7	tü	N	1 70	' U	10	N		N	 '\/	10	N	10
	E	N	\ \walta	1	N	ű	N	1	1	10	13	+13	N	N	10	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	10
	A	N	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	<u> </u>	N	10	⊤יֹגי	N	 	G	 ij	+y-	N	\ \(\su_{\substack}\)	10	N	10
Site	В	N	1	N	W	d	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	٠ نو	\ \n	10	10	10	N	10	iğ.	1	9
2170	C		 1	N	N T	Ö	1	· ·	1 7	10	Ü	N	N	100	io	N	9
1	D	N	1	IV	 ',	a	N	11	N	10	Ü	N	()	24	10	1,7	/0
	E	N	\ \ \ \	N	N	b	10	JU.	H	N	N	13	(1)	N	10	W	10
	A	M	, JJ	TN	N	N		P	W	Ci	N	1	N	1	N	N	10
C :40	В	N.	μ	W	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	N	N	N	N	10	N	1 D	N	W	10	N	10
Site	C	N	1	N	W	Ü	N	N	P	N	N	N	7	N	N	W	10
2	D.	N	JJ	N	N.	17.	N	P	P	N	10	N	N	N	N	N	9
	E	N	<i>N</i>	N	N	N	N	N,	N	10	N	N	N	,J	N	N	8
	Α	<i>N</i> .	μ.	$\top N$	(V	1/2	ν	10	N		N	N.	N	N	12	N	9
Site	В	N	N	N	N	N	N	N	\ \mathcal{P}	10	10	10	W	N	12	N	8
	C	N	N	V	W	10	N	P	\sim	10	N	12	0)	P	10	N	30
3	D	N	14	/V	10	N	\sim	ρ	μ	10	N	2	2	μ	N	2	7
	E	<i>\</i> \	<i>\\</i>	įU	M	. N	N	ע	ν.	10	N	\mathcal{N}	N	ν.	N	, N	9
<u></u>	Α	N	N	/V	N	7	\sim	N	N,	<i>N</i> .	N	N	Ń	μ	10	B	0
Site	В	ν	N	JV	Ν,	N	N	P	N_	10	N	2	N	N.	10	B	0
4	С	\sim	<i>N</i>	N	1	ρ	N	ρ	N	I N	N	N	<u>N</u>	14	10	8	0
7	D	N	μ	ĺ	<i>N</i>	N_	P	ν	N	N	N	N	N	ν	N :	<u> </u>	0
	E	ν	N	ان	<i>[</i>]	\mathcal{O}	10	<u> </u>	ν	O	10	N	$\overline{\mathcal{N}}$	N	N	B	<u>ل</u>
Initial		79/	400	700	MO	<u> </u>	7000	70°	700	14	MP	mO	illo	790	3	790	700
Date	<u> </u>	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	925	9/250	927	9/28	9/29	9/30	10/1	10/1
	(i)		أيا	Key: D=	=dead,	N=nor	mal acti	vity, A=	-abnorr	nal acti	vity B=	no obse	ervation	S			· .

Comments: 9-TP 192	,	,	,,,	 		• •	
		c		•	*** ,		

Job Number:	173-01-01	_,
Species:	H.Gzteca	

Beginning Date & Time: 9-3-03 1720 Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

	1	Day													
Conc.	Rep.	0	11	2	3	4	5	6	7	8	9	10	11	12	13
	Α	В	B	1B	B	B	B	\sim	LN_	<i>N</i>	B	<u>~</u>	N	N	N
-	В	B	В	B	B	B	В	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>	N	ν	B	N	N	N	N.
6.40	С	В	B	B	3	В	В	ν	N	Ν	B	N	N	N	N
5//-	D	B	B	\mathcal{B}	3	B	B	IV	N	· N	B	N	N	12	N
Site 5	E	B	B	13	3	B	B	~	10	μ		\ \mathcal{N}	N	1	N
	A	R	B	B	3	B	В	Ν	N	~	B	N	N	N	\mathcal{U}
Site	В	B	B	B	8	B	B	~	1	Ν	B	M	N	tú	μ
שו וע	c	B	В	3	3	B	B	N	N	N	В	N	N	<u> </u>	N
/	D	B	В	B	3	B	В	N	N	7	B	ĺν	\\ \(\sigma \)	N	N
6	E	ß.	\tilde{B}	13	B		В	N	. 11	N	B	N	/V	<u> </u>	W
	A	В	В	В	B	8	8	N	N	N	B	V	Ñ	N	IJ
Site	В	В.	В	В	B	B	B	1/-	10	2	B	N _	<i>N</i>	1)	<u> </u>
3//	C	B	ě	B	3		В	N	N	2	B	Ν	N	N	N
コ	D	ß	ß	B	3	3	.B	N	N	N.	3	N	Ν	N	μ
7	E	B	B	13	3	<u> </u>	B	N	N	N	B	Ν	N	N	M
	A	В	B	B	B	B	В	٦,	N	Ν	B	N	Ν	N	\mathcal{N}
Site	В	B	В	B	7	B	В	N	N	N	B	N	- N'.	N	\sim
	C	B	8	BO	an an	В	B	N	N	N	13	~	N	N	\mathcal{N}
8	D	B	B	B	B	13	B	N	V	\mathcal{N}	B	N	N	N	\mathcal{N}
U	E	B	3	B	Z	ρ	B	U	Ŋ	N	B	N	N	N)	Ν,
	A	В	В	B	3	В	В	N	N	N	13	Ν	N	N	ν,
Site	В	B	B	13	3	13	B	N	Ν	N	SE	N	N	N	N
	С	B	В	·B	8	B	B.	N	N	N		μ	, N	N	μ
9	D	В	В	B	Z Z	B	В	μ	N	لري	B	Ν	Λ	Ŋ	Ν,
,	E	B	В	B	\mathcal{Z}	B	В	ν	N	٠ ٢٧	Ø	N		N	Ν
Initia	Initials 720		77.90	TF	9/1	76	MP	TOP	2	1899	ng	1700	TOP	MO	700
Date		9/3	9/4	9/5	640	9/7	98	9/9	9/10	9/11	912	9/13	9/14	9 15	9/16
Key: D=dead. N=normal activity, A=abnormal activity, B=No Observations															

Comments: D & mared one warm 9 5 ms

Job Number: 173-01-01 Species: H.azteca Beginning Date & Time: 9-3-03 1720 Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

		Observations/Live Count													Dav	v 28	
	1							Q	ay		· · · · · · · · · · · · · · · · · · ·						Final
Cono	Rep.	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Observ	
Conc.	A	17	N	N	i	2	Ν	N	7	U	D	N	N	Ν,	10	N	10
Site	В	- 6 -	N	N	'n	2	ν.	N	Ν	N	N	N	Ú	Ν,	N	M	W
J17 -	C	- \	N	N	ν.	2	7	μ	N	10	N	2	\sim	ν,	N	N	8
5	D	N	N.	N	Ñ.	D	N	M	N	12	N	N	N	17	N	μ,	10
3	E	V	N	IV	N	2	N	V	7	7	10	10	N	ν_{-}	N	N	- 8
	A	<u>ν</u>	~	N	N	D	ال	۲	Ν	2	10	N	()	<i>N</i>	N	N	10
C , ,	B		N	N	1	2	~	N	N	2	10	N	\ <u>\</u>	N __	N	N	7
DITE	C	ار	N	N	N	N	N	N	μ	N	l h	1)	10	\mathcal{N}_{\perp}	N	N	6
Site 6	D	$\frac{\mathcal{N}}{\mathcal{N}}$	N	N	N	12	N	V	/V	N	2	N	2	<i>V</i>	N	N	6
0	E		- 2	N	7	2	N	<u> </u>	N	10	10	N	$\square \mathcal{N}$	N,	N	$ \mathcal{N} $	6
		$\frac{\mathcal{N}}{\mathcal{N}}$	N	N	N	12	ν	رر	Ν	N	N	N	N	N	N	N	7
Site	В	$\frac{\mathcal{V}}{\mathcal{V}}$	N	10	N	2	,,,	N	N	N	N	N	N)	<i>N</i> .	10	N	4
Site			N	N	N	2	, V	N	N	N	10	N	N	. ~	N	N	7
	C	<u> </u>	N	N	10	12	N	N	N	N	N	N	10	ر ر	N_	N	6
7	P	 	N	N	N	10	/∨	N	N	N	N	N	N	ν	<i>N</i>	<u> </u>	4
	E	$\frac{R}{N}$	N	N	N	N	~	iV	7	N	N	N	N	μ	N	N	10
Site	B	- / V	N	N	N		~	/\\	N	N	N	N	N	\mathcal{P}	N	Ν	40
SITE	C	- / V	N	N	N	N	<i>/</i> /	ÍV	N	N	N	N	N)	μ	N	N	9
8	<u>D</u>	~	~	N	;v'	2	7	N	N	N	N	N	N	μ	N	N	8
0	E	- /\'\	N	N	N	79	W	N	7	N	N	N	10	<i>M</i> .	N	N	9
		$\frac{V}{N}$	N	N	,	V	N	N	N	N	N	N	Ŋ	μ	N	N	6
Site	B	_/ <u>\</u>	72	N	N	2	10	N	N	7	N.	N		N	12	N	8
DITE	·C	$\frac{\mathcal{N}}{\mathcal{N}}$	N	N	N	Ü	W	N	N	N	N	12	N	η,	N	N	10
9	D	D	<i>V</i>	N	70	$\dot{\mathcal{O}}$	W	N	Ν	N	N	N	W	N	10	N	7
. '	E	-/ \(\mu -	<u>'u</u>	W	10	0	P	N	Y	N	V	N	<u> </u>	ν	<u> </u>	N	7
Initia		700	100	700	TRAP	34	700	7010	TOP	NAP	MP	MO	WS.	70kg	Me	7783	7000
Date		9/17	9/18	9/19	9/20	921	9/22	9/23	9/24	9/25	9 250	927	9 28	9/29	930	10/1	10/,
Date		917		11117		3		with A -	abnorr	nal acti	vity R=	no obse	ervation	is .			

		177
Job Number:_		173-61-61
Species:	11	674066

Beginning Date & Time: 9-3-03 1720 Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

	Г							D	ay						
Conc.	Rep.	0	1	2	3	4	5	6	7	8	9	10	11	12 N	13 N
00110.	A		В	В	3	<u>1933</u>	B	74	2	N	B	~	N	10	
	В	Ř	B	B	3	13	B	N	N	N	B	N	N	<u> </u>	N
Site	C	B	В	N	3	B	B	<i>N</i> ,	N	10 N	8	N	N	N	2
Site 10	D	BBB	B	ゅ	3	B	10	~	N	·	B	M	N	22	N
10	E	B	В	N	3	<u> </u>	13	N	N	N	B.	N	N	<u> </u>	
	Α														
	В	•									ļ				
	С						<u> </u>	·				 			
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	Α								ļ		<u> </u>	 -			
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initia		TAP	TAP	-TH	0/	Æ	me	708	M	TOP	W	700	TAP	me	199
Date		9/3	9/4	74					910	9/11	vity, B=	9/15	9/14	9/15	9/16

Comments:

Job Number:	173-01-01	
	H.gzteca	

Beginning Date & Time: 9-3-03 1720 Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

•			*	Observations, 2000									Da	y 28			
									ay.				0.5	. 06	.27	Observ	Final
Conc.	Rep.	14	15	16	17	18	19	20	21	22	23	24	25 N	26 N		Observ	9
	Α	N	N	ν	\sim	7	N	ν_	N	N	$+\mathcal{V}-$	N N			l n	N	6
Site	В	N	N	N	N	12	μ	N	\\\\.	N	N/	N	N	ν	10	W W	8
	C	Ν	N.	Ν	N	N	N	N	رم	10	N	N	N	<i>N</i>	10	N	6
10	D	N.	N	7	N	N	\sim	N	Ν,	N	\mathcal{N}	10	N	N	+12-	N	-
س س	E	N	N	\sim	N	N	ν_	N	jU	N	N	72	N	<i> </i> V	 10	<u> </u>	<u> </u>
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	Е		1	30		700	77700	100	780	M	INP	WP	NP/	TOP	MP	7000	796
Initia		700	TAP	TOAP	TOP	927	700	9/2	9/24		9/28	9/27	96	700	9/30	10/1	10/1
Date	•	9/17	9/18	9/19	9/20	41U	nal acti	vity A =	abnori	nal act	ivity B	=no obs		15	···•••		
			İ	Key: D	= aeaa,	14=11011	nai acti	vity, ~~	-4011011							•	

Comments:	 - :		7.54		See See	_
				-4		_
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				 · · · · · · · · · · · · · · · · · · ·		_

Client/Toxicant:	173	
Project Number:	01-01	
Species: \overline{H}	074666	

Beginning Date & Time: 9-3-43 1720	Į.
Ending Date & Time: 10 - 1 - 63 100c	
Hatch Date:	٠

A m erican Aquatic Testing, Inc. Weight Data										
			A	В	(B-A)*1000=C	D	C/D	C/E		
		· [weight of	weight of	dry weight of	# of	mean dry	IC25 & NOEC		
		Pan	boat	boat & org.	organisms	surviving	weight	cale. weight		
Cone.	Rep	#	(g)	(g)	(mg)	org.	(mg)	(mg)		
	Α	1 2		0.00552	0.000 U	10	0.067	0.067		
	. B	2		0.00582	0.69	9	0.077	0,00		
·	С	3		0.00479	0.76	io	0.076	0.076		
1	D			0.00509	0.80	10	0.080	0.080		
Control	Ε	S		0.00535	0.79	10	6.079	0.079		
	75.					•				
	G	ļ .								
	N									
	A	(g	0.00 433	0,00520	0.87	10	780.0	0.087		
_	В	٦	0.00448	0.00523	0.75	9	0.083	0.075		
Site	С	8	0.00475	0,00570	6.95	9	0.106	0.095		
10-	D	9	0,00453	6.00539	0.86	10	0.086	0.086		
i	E	10	0.00377	0.00478	1.01	10	0.101	0.101		
1	F									
,	G				<u> </u>					
	Н		<u> </u>			<u> </u>	<u> </u>			
:	A	11	0.00454	0.00527	6.73	10	0.073	0.073		
C-4	В	12		0.00569	1.08	10	0.108	0,108		
$\mathcal{I}^{\prime\prime}$	C	13	0.00481	0.00500	0.79	10	0.074	0.079		
	D	14		0.00470		9	0.072	0.065		
Site 2	E	15	0.00431	0.00197	0.60	8	6.075	0.060		
	F	 	 		<u> </u>	 	<u> </u>			
• •	G	 		 	<u> </u>		ļ			
	H	1,,	13 5 3 1/6 7	1 6 00 CDE	1 - 110		+	10000		
	A B	10		0.00 505		9	0.053	0.048		
Site	C		0.00466	0.00525	0.59	8	0.074	0.059		
Site 3	D	18		0.00501	0.66	9	0.073	0.066		
7	E			0.00528		1 9	0.083	0.058		
	F	20	0.00 574	0.00467	0.73	+ 4	180.0	0.073		
	G	+	 				 			
	H	 	 	 			+			
		itials	1 76	156	16	7780	1 76	176		

Date 10/01 10/8 10/8 10/2 10/8E = Original number of organisms at test initiation, adjusted for losses.

Observations: 0.07 10/8

Client/Toxicant:	173	· ·	Beginning Date
Project Number:	01-01		Ending Date & 7
Species: H	azteca		Hatch Date:

Beginning Date & Time: $\frac{9}{100}$	3-03	1720
Ending Date & Time: <u>i </u>	1-03/00	
Hatch Date		

American Aquatic Testing, Inc.
Weight Data

Weight Data									
			Α .	В	(B-A)*1000=C	D	C/D	C/E	
			weight of	weight of	dry weight of	# of	mean dry	IC25 & NOEC	
		Pan	boat	boat & org.	organisms	surviving	weight	cale. weight	
Cone.	Rep	#	(g)	(g)	(mg)	org.	(mg)	(mg)	
	Α		-	~		0			
C_{-}	В	-			_	0			
Site	С	_		-		0		_	
	D	_	_	E	-	0			
4	E	_	_			0			
•	F		_	·					
·	G	_	-						
	H		_						
\overline{C}	A	21	0.00503	0.00585	0.82	10	0 082	0.082	
Site	В	22		0.00530	0.76	io	0.076	0.076	
<i>- -</i> .	С	23		0.00519	0.73	8	0.091	0.073	
	D	24		0.00465	6.58	10	0.058	0.058	
5	E	25	0.00511	0,00 57060	0.55	8	0.069	0.055	
>	F	ļ							
	G	<u> </u>		<u> </u>	<u> </u>				
	Н	 				ļ		 	
	A	26		0.00451	0,52	10	0,052	0.052	
	В	27	0.00501	0.00529	0.28	7	0.040	0.028	
Site	C	28		0.00438	0.42	6	0.075	0.045	
_	D E	29		0.00 413	0.31	6	0.052	0.031	
ľ	F	30	0.00404	0.00434	0.30	6	0,050	0.030	
6	G	3+	 	 	<u> </u>	+			
	Н	-	· 		-	+	 	- 	
	A	31	0.00491	0,00484	0.30	7	0.043	0.030	
Site	B	32	0,00364		0.19	4	0.048	0.030	
Site	C	33		0.00490	0.46	7	0.006	0,046	
	D	34	0.00494	0.00504	0.36	1	0.060	0.036	
7	E	35		0.0030	0.29	4	0.073	0.029	
T T	F	1	10.00	10.00 701	<u> </u>	 	1 0.0 10	10.021	
	G	1		1		+			
	H	1	1	 			<u> </u>	1	
		itials	76	16	26	TON	JE	JE	
	1)	ate	1001	10/8	1018	16/2	1018	1018	
					at test initiation				

Observations	E = Original number of organisms at test initiation, adjusted for losses.					
Observations:						
·.	<u>·</u>					
\$1.						
RasicWT wk3						

Cilent/Toxlcant:_	173		·
Project Number:	01-01		
Species:	it atteco	1	

Beginning Date & Time: 9-3-03 172
Ending Date & Time: 10-1-03 1000
Hatch Date:

V	Ve	ia	ht	Data

Weight Data										
			Α	В	(B-A)*1000=C	D	C/D	C/E		
			weight of	weight of	dry weight of	# of	mean dry	IC25 & NOEC		
		Pan	boat	boat & org.	organisms	surviving	weight	cale. weight		
Cone.	Rep	# .	(g)	(g)	(mg)	org.	(mg)	(mg)		
	Α	36	0.00421°	0,00443	0.39	10	0.039	0.039		
	В	37	0.00421	0,00486	20.0	10	0.065	0.065		
Site	С	38	0.00462	0.00514	6.52	9	0.058	0.052		
Site 8	D	39	0.00482	0.00539	0,57	8	0.071	0.057		
×7:	E	40	0,00510	0,00555	0.45	9	0,000	0.045		
0	F									
	G									
	Н	<u> </u>		<u></u>				<u> </u>		
	Α	41		0,00414	0,45	6	0.075	0.045		
Site 9	В	42		0.00552	0.63	8	0.079	0.063		
THE	С	43		0.00499	0.62	10	0.062	0.062		
	D	44		0.00519	0.39	7	0.056	0.039		
a	E	45	0.00472	0.00501	0.29	7	0.041	0.029		
. 1	F									
	G				·					
	Н	<u> </u>								
•	Α	46		0.00508	0.47	9	0.052	0.047		
Site	B.	47		0.00489	0.28	6	0.047	0.028		
	C	178		0.00447	0.37	8	0.046	0.037		
Site 10	D	49		0.00 455		6	0.052	0.031		
10	E	50	0,00,301	00000	0.43	5	0.086	0.043		
1,3		 				- 		ļ		
	G H	 	-		 	 		-		
	A	 	+	<u> </u>	<u> </u>	+		+		
	B	-	<u> </u>		 		-	-		
	C	 	+	 	ļ	 	·			
	D	 	 	 	 		1			
\\	E	+		 		 	 			
\	F	+	-	 	 	 	 	 		
\	G	-	<u> </u> -	 			 	+		
\	Н	+	+	 			 			
·		tials	JF		+	TAP	+ 77	1		
<i>:</i>		ate	10 01	10/8	10/8	10/2	10(8	10/8		
	<u></u>	410	1 101	1 1010	1 0 0	1/1/2	1 010	7 (a) e		

E = Original number of organisms at test initiation, adjusted for losses.

Observations: (1)	0,00404	10/01 JF			
•		<i>F</i>			
		··		 	
			<u> </u>		

Client/Toxicant: 173	Beginning Date & Time: 9-3-03
Project Number: 01-01	Ending Date & Tlme:
Species: Hazleca	Hatch Date:
lagi di serim ne di dia di dia dia dia menganjarah di dia di dia di dia di dia di dia di dia di dia di dia dia	

American Aquatic Testing, Inc.
Weight Data

					nt Data	. * 	·	
			Α	В	(B-A)*1000=C	D	C/D	C/E
	j		weight of	weight of	dry weight of	# of	mean dry	IC25 & NOEC
		Pan	boat	boat & org.	organisms	surviving	weight	cale. weight
Cone.	Rep	#	(g)	(g)	(mg)	org.	(mg)	(mg)
	A	()	0.00412	0.00433	0.21	10	0.021	
	B	3	0.00439	0.00457	0.18	10	0.018	
Pre-	С	3	0.00397	0.00415	0.18	10	0.018	
Pre- Leights	D	4	0.00 411	0.00431	0.20	10	0.020	
Weights	E	5	0.00443	0.00.462	0.19	10	0.019	
· ·	F							
	G							
	Н							
	Α	T	1				·	
	В							
	С							
\mathcal{A}	D						;	
.\	E							
	F							
	G							
	H							
•	Α	Ĭ ·						
ŗ	В				:.			
\ :	. C							
	D							
· \	E							
	F							
	G							
1 _ · ·	Н							
	Α					T		
	В							
(С							
	D							
	E							
	F							
\ \ \	G							
	Н							
	In	tials	TR	TAP	TAS	TAP	TAP	
		ate	9/3	9/4	9/4	9/3	9/4	

1	G		<u> </u>		1		
	H						
	Initials	TR	TAP	TAS	TAP	TOP	
	Date	9/3	9/4	9/4	9/3	9/4	
	E = Or	iginal number	of organisms	at test initiation,	adjusted f	or losses.	
Observatio			,				
							
						·	
BasicWT.wk3							
	•		,				

Job Number:	173-01-01
Species: H-a	zteca

Start Date & Time: ____ End Date & Time: ____

Sediment Test

American Aguatic Testing, Inc.,

		•	Water	Change			r Readir			ting Info	rmation				
Test Day	0	1_1_	2	3	4	5	6	7	8	9	10	11	12	13	14
Morning change(time)	0930	1950	1020	0930		0930	0910		10145	0830	0700	1000	0730	0800	0745
D.O. mg/L	7.6	7.5	8.0	7.7	8.5	7.2	8.4	8,6	8.7	8.6	8.4	8.2	8.2	8,6	8.2
рН	7.4	3.0	7.9	7.9	8,3		8.2	8.2	8,2	8.4	8-1	8.0	8.1	811	8.2
Temp. (C)	24.0	24.0	24.0	23.0		23.0	320		2Z.5	23.0		22.5			122.5
Initials	mp	me	me	Cil	JE	no	TAP	126	JF	JF	700	7000	25	T	36
Date	93	94	195	Office			9/9	9110	9111	1912	9/13	9/14	915	916	9/16
fternoon change(time)	1725	1730	1700	1850	1630	1630		1610	1610	1700	1730	1730	1800	1710	1700
D.O. mg/L	7.6	7.6	8.3	8.5	8.7	7.9	8.4	8.2	8.2	8.5	8.2	8.1	801	8.0	8.4
рН	7.6	79	7.6	8.3	83	7.8	7.6	7.6	7.6	8.1	7.9	7.9	7.9	7.9	8.0
Temp. (C)	23.5		22.0	220	220	23.5			22.5				22.0	23.5	3-3-4
Initials	20	7%	JF	76	JE	AD.			m)	26	700	700	and-	2512	Joh
Date	7/3	9/4	2/5	90	<u> </u>	19/8	9/9	9/10	9/11	9/12.	9/13	9/14	7/15	9/16	9/17
	,	;		,	,	,	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·					
Test Day	15	16	17	18	19	20	21	22	23	24	25	26	27	- 28	
Morning change(time)					0745		1930				1000		0800	0700	
D.O. mg/L	8.2	8:6	8,3	8.2	7.7	8.0	8.0	8.8	8.8		8.8	8.4	8.3		
рН	8.2	8.2	81	7.9	8.0	7.8	7.9	7.6	7.6	7.6	7.7	7.4	8.1		
Temp. (C)	22.5		22.5	23.0	22.5	22.0	22.0		220	22.0	22-0	33.0			
Initials	36	36	20	IK	26	9/1/4	2001	Ar.	JF	NB	Mo	MO	JA		
Date	9118			09/21	9/22	69/23			9/26		9/28	9/28	9/30		
	1700			1930	1700	3300	1630		(800	2000	1600	1730	1800		
D.O. mg/L	8.2	8.9	22	8.6	7.9	3.9	7.7		8.7	8.7	8.8	815	7.8		
pH	7.8	1.1	7.9	7,8	8.0	7.5		7.9	7.7	76	7.7	7.6	2.8		•
	23.0	22.0	230	22,0	220				20	72,0		22.0	مرجو		
	2	923	77/		0P2			no	me	JF.	M	ne.	70,00	W	
Date	9/18	9/19	09/20	09/21	9/22	5/23	9/24	9 25	9/24	4/27	9/28	9(29	9/30	101	
ontrol Sed. collection d	ate/by:_	8-26-03	/TAP)		•	e: <i><u>Aß:</u></i>						ze: <u>3</u> 4		
ontrol Sed. sieve date/b eve size used: /8	ру: <u>Ұ</u> -	-26-65/	190				ot numb als per c					,		: <u>100</u> 175	
ample sieve date/by:	N/	4				ре: <u>У</u>			•				28 da		<u>~ / </u>

Frequency of feeding: 1 x a day Sieve size used:

Test Temperature Range: 23±1°c

Client/Toxicant: 173

Job Number: 01-01

Species: H-azteca

Beginning Date & Time: 9-3-03 173 c Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

<u> </u>							Day					
Parameter	Concentration	0	1	2	3	4	5	6	7	.8	9	10
	Control	22.5	22.0	22.5	220	22.0	22.5	22.0	22.5	22,e		22.0
	Site 1	22.5	22.0	22.5	22.0	22.0	225	22,0	22.5	22.0	22.0	22.0
T	Site 2	225	320	22.5	220	22.0	22,0	22.0	22.5	22.0	22.0	22.0
E	Site3	22.5	J). v	22.0	22.6	22.0	220	22.3	22.0	22.0	22.0	29.0
M	Site4	22.5	32.0	22.0	22.0	22.0	22.0	22.0	20.0	22.0	22-0	39.0
P	Site 5	22.5	77 3	22.0	220	22.0	220	22.0	39 O	22.0)2,0	29.0
	Site6	22.5	22.0	220	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
(C)	Site7	23.0	22.0	220	22.0	22.0	22.0	22.0	غ <i>ک</i> ا. O	22.0	22.0	22.0
	Site 8	23.0	22.0	27.0	220	220	22.0	22.0	22.O	22.0	22-0	22.0
	Site9	23.0	22.0	220	22.0	22.0	22.0	22.0	22.0	22.0	350	99.0
	5. te 10	23,0	77.0	22.0	22.0	22.0	22.0		22.0	22.	22.0	99.0
	Control	5.9	6.3	7.5	72	4.8	6.4	6.9	6.8	6.7	7.2	6.6
	Site1	6.8	6.5	78	7.7	7.3	6.7	7.3	7.1	7.3	7.5	7.2
	Site 2	6.7	6.7	7.8	7.4	7.3	6.7	7.4	7.2	7.2	7.5	7.1
Dissolved	Site 3	5.1	6.2	7.2	4.13	6.7	6.2	6.4	6.1	6.0	6 · C	5.5
Oxygen	Site4	5.2	6.1.	7.1	4.15	7.2	6,5	7.0	6.9	7.0	7.4	7.0
	Sites	5.3	6.0	7.2	6.7	7.2	6.7	6.8	6.7	6.6	7.2	7.0
(mg/L).	Site6	5.8	6.7	7,3	7.3		6.5	6.8	7.1	6.8	7.2	6.9
	Site 7	5.1	6.3	7.2	7.1	7.4	6.5	7.0	7.1	6.9	7.2	6.9
- \ ,	Site8	5.1	6.5	7.3	7.0	7,3	65	7.0	0.7	6.9	7.3	7.0
	Site9	5,0	6.3	7.3	7.0	7.3	6.5	7.1	7.0	6.9	7.5	7.1
	Sitelo	5.0	6.7	7.2	7.3		6.5	7.1	1.0	6:7	7.60	7.2
	Control	7.6	6.5	7.5	7.7	7.8	7.3	7.6	3.8	7.5	8.0	7.9
· .	S.+c1	7.5	6.7	7.6	7.7	7.8	7.4	7.6	7.8	7.8	7.8	7.8
	Site 2	7.4	6.9	7.6	7.7	7.9	7.4	7.5	17.7	7.8	7.8	78
	Site3	7.4	6.9	7.6	7.7	1.8	1.4	7.4	7.6	7.8	7.7	76
	Site4	7.3	7.0	7.6	7.6		7.4	7,4	File	7.8	7.8	7.7
рH	- Sites	7.2	7.0	7.10	7.6	7.8	7.4	7.4	7.6	7.7	7.8	7.7
	51+26	7.2	7.1	17.7	(6)	18	1.4	7.5	1 + 7	7.7	7.8	7.7
	Site 7	7.2	7.2	177	7:7	17.8	7.4	1.5	177	7.8	7.8	7.8
	Site8	7.2	7.2	17.7	175	7.9	7.5	7.5	17.7	7.8	7-8	7.8
•	5.469	7.2	32	17.7	111	173	13.5	135	7.8	7.8	3-8	7.8
L	Site 16	4.5	7,2	17.7	1	1 (.7	17.5	1/3	1100	1.	7.8	7.9
	Initials Date	9/3	950	mo	alla	12/-	and the	27	140 140	31	140	7090
•	Date	175	1114	1915_	19/6	<u> </u>	1//8	1/7	17/10	1///	9/12	19/13

									(3:2)
	Cond. (umhos)	Alkalinit	y (mg/L)	Hardnes	s (mg/L)	Ammoni	a (mg/L)	Comments: ODay 7
Concentration	Initial	Final®	Initial	Final	Initial	Final	Initial	Final	
Control	275	2 %℃	60	80	80	120	0.04	0,00	
Site1	275	270	70	70	70	100		0.02	
Sitc.2	275	275	70	70	80	100	0.00		
Site 3	275	275	60	70	80	100	0.10	0,00	
Site4	275	275	60	60	80	90	0,00	0,00	
Sites	280	275	70	60	70	90	0.13	0.01	
Sitc 6	270	270	60	60	70	90	0.13	0.03	
Site 7	280	Q75	70	70	80	100	0.16	0.01	
Site8	260	270	70	70_	80	100	0.15	0.02	
5.te9	280	275	70	80	80	110	0.23	0,02	
Site 10	270	275	50	60	80	100	0.09	0.02	
Initials	157	1.6	94	978	20	40	不少	my	
Date	9/3	910	9/3	10/1	1/3	10/1	9/3	10/1	

FWSEDPAR. 183

Cilent/Toxicant:		17	3	<u>. 14 . s</u> .
Job Number	0	1-0	7	7.7
Species	4. 9	7 te	ca	

Beginning Date & Time: 9-3-03 1720 Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

				ar are get	11.4		Day					
Parameter	Concentration]]	12	13	14	15	16	17	18.	19	20	21
	Control	23. o	20.0	22.0	22.0	22.5	22.0	23.0	225	23.0	22.0	23.0
	Sitel	23.0	2 2.0	22.0	22.0	22.5	22,0	23.0	22.5	23.0	22,0	23,0
T	Site 2	23.0	22.0	22.0	22.0	25.66	22.0	33.0	22.5	23.0	22.0	33.0
E	Site3	23.0	22.0	22.5	33.0	22.5	22.0	23.0	22.5	23.0	22.0	23.0
M	Site4	23.0	22.0	22.5	a. (.c	225	22.0	23.0	22.5	23.0	22.0	,}3. હ
Р	Sites	23.0	22.0	22.5	6.66	22.5	22.0	23.0	22.5	23.0	22.0	23.0
	Site6	23.0	22.0	22.5	20.0	22.5	22.0	23.0	22.5	23.0	22,0	23.0
(C)	Site 7	23.0	22.0	22.5	JJ. 3	22.5	22.0	33:0	22.5	23-0	22.0	23-0
	Site 8	23.0	22.0	22.5	32.0	225	22.0	23.0	22.5	23.5	22.0	23.0
	Site 9	23 s	22.0	22.5	27.0	22.5	22.0	33.0	22.5	23.0	22.0	730
	5,1010	230	22.C	225	23.0	22.5	22.0	23.0	122°C	123-0	122.0	33.0
	Control	6.8	6.6	6.7	6,9	6.8	6.7	6.6	61	6.3	6.4	6.6
	Site 1	7.3	17.0	6.7	70	7.0	7.3	7.0.	lei	6.5	6.3	6.4
	Sitea	7.1.	17.0	20	7.2	71	7,4	7.1	6.8	6.7	6.6	6.5
Dissolved	Site 3	5.7	161	5.7	5.9	5.8	5.9	5.4	5.5		5.2	5.8
Oxygen	Site 4	71	1 <u>†ŏ</u>	6.8	6.8	6.8	<u> </u>	6.9	6.3	6.8	12.8	59
1	Site 5	7/	6.9	6.6	6.9	6.8	61	6.6	(0.0	6.4	6.5	6.1
(mg/L)	Site 6	1 7 0	68	6.4	6.7	6.9	6.6	16.5	(4.7		6.7	7.1
	Site 7	7.0	I VIL	6.5	6.8		6.9	7.0	(8.5		6.9	
<u>}</u> :	Site 8	7.0	100	6.6	6.7	7.0	7.0		6-2	6.0	-	7.0
	Site 9		6.8	6.4	6.9	6.8	7.0	7.	<u>(4.3</u>		6.5	-
—	Control	79		7.5	10.1	7.7	8.1	7.7	7.6		8.1	7.9
	Site 1	7.8		17:3	7.6		7.9	7.8	7.4		8.0	7.8
	Site 2			1155	7.6	7.8	7.8	78	7.0		72	7.8
1	Site 3	77		7.4	7.5		123	7.6	7.6	7.4	7.8	
	Sitey	7		7.4	7.5	7.8	7.7	7.7	7.0	a 7.6	7.8	7.8
рH	Sites	78	7.5	7.8	7.6	7.8	7.9	7.8	7.	7.6	7.8	7.8
1	Siteb	7.8	7.5		7.7	7.8	8.0	7.9	7.8	3 7.8	7.9	7.8
	Site	7 75		7.8	7.7	7.8	8.0	7.9	7.9	7.9	7.9	7.8
	Sites			7.8	7.7	7.8	17.9	7.9	77,9	7.9		7.8
	Site	7.0		77	7.8	7.8	7.9	7.8	7.8	7.9	7.8	7.9
	Sitel		1 A A/1		7.7	7 7.8	17.8	17.8	7.8	7.7	7.7	7.8
	Initiais Date	100		3716	100	$\frac{\mathcal{D}}{2}$	12	900	135	TOP	3	720
	Date	17/1	1117	1/16	9//	7 9/18		1 117	<u> </u>	1 9/2	1/2	319/24

	Cond. (umnos)		Alkalinit	y (mg/L)	Hardnés	s (mg/L)	Ammoni	a (mg/L)	Comments ODay 14
Concentration	-Initia€	-Final	Inittel	Final	Initial	Final	Initial	Final	@ Day 21
Control	280	290							
Site1	275	780	0						
Site 2	280	285							
5173	989	285							
5,74	280	285							
Sites	270	280	8			÷	·		·
Site6	270	385	l i						
57te 7	275	280							
Site 8	280	280							
S.te9	275	285							
Site lo	280	285			2,				
Initials	TAP	THE						/	
Date	9/17	9/24	l					ļ,	

Client/Toxicar	nta <u>i sesa.</u>	173	· · ·
Job Number		1-01	
Spaciac	11 0	7+116	25.5

Beginning Date & Time: 9-3-03 1720
Ending Date & Time: 10-1-03 1000

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

			egi e i i i i i			2.6	Day					
Parameter	Concentration	೩೩	23	24	25	26	27	28	29	3.0	31	3:2
g to System in the	Control	20.0	230	22.0	220	23.0	23.0	22.0				
	Site1	က်ဝ	23.0	22-0	22-0	23.0	23.0	220				
τ	Site 2	22-0	22.5	22.0	220	23.0	23.0	20.0			·	
E	Site 3	220	22.5	22.0	20	23.0	23.0	22.0				
М	Sitey	220	22.5	22.0	22.0	23.0	23.0	22.3				
Р	Sites	72-0	22.5	72.0	22.0	27.0	33.0	22.0				
	Site 6	22.0	22.5	22.0	22.0	23.0	23.0	22.0				(
(C)	Site 7	22.0	22.5	220	22.0	27.0	23.0	22.0				
	Site 8	220	22.5	22.0	220	33.0	23.0	22.0	7.4			
	Site 9	220	27.5	72.0	220	230	23.0	22.0				
1.0	Site10			22.0	22.0	23.0	23.0		<u> </u>	<u> </u>		
	Control	18-00	₽5.5	57	15.9	6.3	5.5	<u>(j.0</u>				
	Site 1	7.0	6.4	63	5.9	6.0	6.0	6.7				
	Site2	69	6.4	63	6-2	6.5	6.4	66	<u> </u>	<u> </u>		
Dissolved	Site 3	5.6	5.2	- 50	5.60	2.3	5.0	5.3	<u> </u>	<u> </u>		
Oxygen	Site 4	6.4	6.2		6.0	6.3	6.2	6.6				
	Sites	, — - -	(e ic	161	6.0	6.2	6-0	6.1				
(mg/L)	Site 6	6.5	6.0		60	(.)	(6.1	6.3	\			
	Site 7	65	6.0		60	6.4	6.3					
ľ	Sited		(0.0		61	6.2	60	هَ.مَ	Ч			
·. [Site		(p.0	60	62	16.4	61	<u> C. 4</u>		- 		
	Sitel		(6,2		62	6.5	163	10.7	3 GI			
	Control	8.0	8.5	8.4	8.5	8.3	8.4	1/2.6	3) 8.1			
	Site		8.		8.4	8.3		163	128			
	Site:		8/1	8.1	8.2			18.3	1 2.7			
· [Site	7.6	3.0	8.0	7.9			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	1 22	<u></u>	 	
ننام	Site	5 75	17.		7-7		17.7	7/4	20	1		
pH	Site	2 7.6	176		7.9		1 7.8	121	1 2.6			
	5,76	7 7.8	7		8-0				7.1		_	
	Site	7 7.8						7.5		7		
· .	Site	7		79	7.8			$\frac{1}{7.5}$	1/2/	5		
	Site		7.0							5		
	Initiais		TR	INP	MP	30%						
	Date	9/2		6927	- 9/2		9 9 3			,		

	Cond. (urnhos) Alkalinit	y (mg/L)	Lucedosa	s (mg/L)	Ammonia	· (m = /1 \)	Commonto.
			A (mAr)	nardites	s (myr)	Annitoria		Comments:
Concentration	Tritial Fina	ıl Initial	Final	Initial	Final	Initial	Final	070mp 9/25
Control	350							
Site1	320							@ Conductivity on day 28
Sitea	320							
Site 3	320							(3) OH REDONE METER
Site 4	310							3) OH REDONE METER NOTCALIBRATED POOL
Sites	310							
Site 6	315							,
Site 7	325							
Site 8	325				1			
Site9	1925			. 1				
Sitelo	1310							
Initials	el/cn	.)					1	
Date	1011				1			

STATISTICAL DATA FOR Hyalella azteca 28-DAY

SURVIVAL

USING CONTROL SEDIMENT

Matteo Metals H. azteca 28d surv. date 09/03/03

File: d:\toxstat\1730101h.asu Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN		
1	Control	5	1.249	1.412	1.379		
2	SITE 1	5	1.249	1.412	1.347		
3	SITE 2	5	1.107	1.412	1.318		
4	SITE 3	5	0.991	1.249	1.169	•	
5	SITE 5	5	1.107	1.412	1.290		
6	SITE 6	5	0.886	1.412	1.012		
7	SITE 7	5	0.685	0.991	0.848		
8	SITE 8	5	1.107	1.412	1.286		
9	SITE 9	5	0.886	1.412	1.078		
10.	SITE 10	5	0.785	1.249	0.983		

Matteo Metals H. azteca 28d surv. date 09/03/03

File: d:\toxstat\1730101h.asu Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP IDENTIFICATION	VARIANCE SD	SEM	C.V. %
1 Control	0.005 0.073	0.033	5.28
2 SITE 1	0.008 0.089	0.040	6.63
3 SITE 2	0.019 0.138	0.062	10.44
4 SITE 3	0.014 0.117	0.052	10.00
5 SITE 5	0.028 0.167	0.075	12.94
6 SITE 6	0.052 0.228	0.102	22.53
7 SITE 7	0.024 0.155	0.069	18.26
8 SITE 8	0.017 0.129	0.058	10.03
9 SITE 9	0.041 0.203	0.091	18.81
10 SITE 10	0.036 0.190	0.085	19.31

```
Matteo Metals H. azteca 28d surv. date 09/03/03
File: d:\toxstat\173010ih.asu Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.974
W = 0.935

Critical W (P = 0.05) (n = 50) = 0.947
Critical W (P = 0.01) (n = 50) = 0.930

Data PASS normality test at P=0.01 level, Continue analysis.

Matteo Metals H. azteca 28d surv. date 09/03/03
File: d:\toxstat\173010ih.asu Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated Bl statistic = 7.53

Table Chi-square value = 21.67 (alpha = 0.01, df = 9)
ble Chi-square value = 16.92 (alpha = 0.05, df = 9)

Data PASS Bl homogeneity test at 0.01 level. Continue analysis.
```

Matteo Metals H. azteca 28d surv. date 09/03/03

File: d:\toxstat\1730101h.asu Transform: ARC SINE(SQUARE ROOT(Y))

TITC. G. (COMBCGC	(1,20101)	ir. ubu	TIGHTOIM. A	C DIME (DOOM	KE KOOT (1/)	
			ANOVA TABLE			
SOURCE	DF		SS	MS	F	7.7
Between	9		1.487	0.165	6.789	
Within (Error)	40		0.974	0.024		
Total	49		2.461			· - -

Critical F value = 2.12 (0.05,9,40) Since F > Critical F PRIFOR VI-Since F > Critical F REJECT Ho: All equal

Matteo Metals H. azteca 28d surv. date 09/03/03
File: d:\toxstat\1730101h.asu Transform: ARC SINE(SQUARE ROOT(Y))

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
	Control	1.379	0.980		
\mathbf{U}_{2}	SITE 1	1.347	0.960	0.330	
3	SITE 2	1.318	0.940	0.618	
4	SITE 3	1.169	0.840	2.132	
5	SITE 5	1.290	0.920	0.906	•
6	SITE 6	1.012	0.700	3.721	*
7 .	SITE 7	0.848	0.560	5.390	*
8	SITE 8	1.286	0.920	0.948	
· · ·9	SITE 9	1.078	0.760	3.060	*
10	SITE 10	0.983	0.680	4.020	*

Matteo Metals H. azteca 28d surv. date 09/03/03

SITE 7

SITE 8

SITE 9

SITE 10

- 5

5

8

9

10

File: d:\toxstat\1730101h.asu Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2	OF 2 Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	5			
_ 2	SITE 1	5	0.145	14.7	0.020
3	SITE 2	5	0.145	14.7	0.040
4	SITE 3	5	0.145	14.7	0.140
5	SITE 5	5	0.145	14.7	0.060
6	SITE 6	5 .	0.145	14.7	0.280

0.145

0.145

0.145

0.145

0.420

0.060

0.220

0.300

14.7

14.7

14.7

14.7

TLE: Matteo Metals H. azteca 28d surv. date 09/03/03
LE: d:\toxstat\1730101h.asu
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 10

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Control	1	1.0000	1.4120
1	Control	2	0.9000	1.2490
1	Control	3	1.0000	1.4120
1	Control	4	$\overline{\hat{1}}$. $\overline{\hat{0}}$ 000	1.4120
1	Control	5	1.0000	1.4120
2	SITE 1	1	1.0000	1.4120
2,	SITE 1	2	0.9000	1.2490
2	SITE 1	3	0.9000	1.2490
2	SITE 1	4	1.0000	1.4120
2.	SITE 1	5	1.0000	1.4120
3	SITE 2	1	1.0000	1.4120
3	SITE 2	2	1.0000	1.4120
3	SITE 2	3	1.0000	1.4120
3 3	SITE 2	4	0.9000	1.2490
3 4	SITE 2	5	0.8000	1.1071
4	SITE 3 SITE 3	1 2	0.9000	1.2490
4	SITE 3	3	0.8000	1.1071
	SITE 3	4	0.7000	1.2490 0.9912
	SITE 3	5	0.9000	1.2490
5	SITE 5	1	1.0000	1.4120
5	SITE 5	- 2,	1.0000	1.4120
5	SITE 5		0.8000	1.1071
5	SITE 5	3 4 5	1.0000	1.4120
5	SITE 5		0.8000	1.1071
6	SITE 6	1	1.0000	1.4120
6	SITE 6	2	0.7000	0.9912
6 6	SITE 6	3	0.6000	0.8861
6	SITE 6 SITE 6	4	0.6000	0.8861
7	SITE 7	5 1	0.6000 0.7000	0.8861
7	SITE 7	2	0.4000	0.9912 0.6847
7	SITE 7	2	0.7000	0.9912
7	SITE 7	4	0.6000	0.8861
7 ·	SITE 7	5	0.4000	0.6847
8	SITE 8	. 1	1.0000	1.4120
8	SITE 8	.2	1.0000	1.4120
8	SITE 8	3	0.9000	1.2490
8	SITE 8	4	0.8000	1.1071
8	SITE 8	5 1	0.9000	1.2490
9	SITE 9		0.6000	0.8861
9 9	SITE 9	2	0.8000	1.1071
_9	SITE 9	3.	1.0000	1.4120
	SITE 9 SITE 9	4 5	0.7000	0.9912
	SITE 9 SITE 10	1	0.7000	0.9912
10	SITE 10	2	0.9000 0.6000	1.2490
10	SITE 10	3	0.8000	0.8861 1.1071
10	SITE 10	4	0.6000	0.8861
10	SITE 10	5	0.5000	0.7854
	•			0.,004

STATISTICAL DATA FOR *Hyalella azteca* 28-DAY GROWTH USING CONTROL SEDIMENT

Matteo Metals H. azteca 28d grow. date 09/03/03

le: D:\TOXSTAT\1730101H.AGR Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control SITE 1	5	0.067	0.080 0.106	0.076 0.093
3	SITE 2 SITE 3	5 5	0.072 0.053	0.108 0.083	0.081 0.073
5 6	SITE 5 SITE 8	5	0.058	0.091 0.071	0.075 0.057

Matteo Metals H. azteca 28d grow. date 09/03/03

File: D:\TOXSTAT\1730101H.AGR Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GR₽	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
	Control	0.000	0.005	0.002	6.82
	SITE 1	0.000	0.010	0.005	11.03
3	SITE 2	0.000	0.015	0.007	18.56
4	SITE 3	0.000	0.012	0.005	16.32
5	SITE 5	0.000	0.013	0.006	16.70
6	SITE 8	0.000	0.013	0.006	22.23

Matteo Metals H. azteca 28d grow. date 09/03/03
File: D:\TOXSTAT\1730101H.AGR Transform: NO TRANSFORMATION

Dapiro - Wilk's test for normality

D = 0.003
W = 0.978

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals H. azteca 28d grow. date 09/03/03
File: D:\TOXSTAT\1730101H.AGR Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated Bl statistic = 3.80

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)

ble Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS Bl homogeneity test at 0.01 level. Continue analysis.

Matteo Metals H. azteca 28d grow. date 09/03/03

e: D:\TOXSTAT\1730101H.AGR Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.003	0.001	5.082
Within (Error)	24	0.003	0.000	
Total	29	0.007		

Critical F value = 2.62 (0.05,5,24)

Since F > Critical F REJECT Ho: All equal

Matteo Metals H. azteca 28d grow. date 09/03/03

File: D:\TOXSTAT\1730101H.AGR Transform: NO TRANSFORMATION

D	UNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <t< th=""><th>reatment</th><th></th></t<>	reatment	
OUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Control	0.076	0.076		
2	SITE 1	0.093	0.093	-2.277	
3	SITE 2	0.081	0.081	-0.759	•
4	SITE 3	0.073	0.073	0.407	
5	SITE 5	0.075	0.075	0.081	
6	SITE 8	0.057	0.057	2.602	*

-----Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

Matteo Metals H. azteca 28d grow. date 09/03/03

File: D:\TOXSTAT\1730101H.AGR Transform: NO TRANSFORMATION

	DUNNETT'S TEST -	TABLE 2	OF 2	Ho:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Di (IN ORIG. UNIT		DIFFERENCE FROM CONTROL
1	Control	5			
2	SITE 1	5	0.017	23.0	-0.017
3.	SITE 2	5	0.017	23.0	-0.006
4	SITE 3	5	0.017	23.0	0.003
5	SITE 5	5	0.017	23.0	0.001
6	SITE 8	5	0.017	23.0	0.019

Matteo Metals H. azteca 28d grow. date 09/03/03
D:\TOXSTAT\1730101H.AGR
TRANSFORM: NO TRANSFORMATION NUMBER OF GROU

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1	Control	1	0.0670	0.0670	
1	Control	2	0.0770	0.0770	7
1	Control	3	0.0760	0.0760	
1	Control	4	0.0800	0.0800	
	Control	5	0.0790	0.0790	7,.
1 2	SITE 1	1	0.0870	0.0870	
2	SITE 1	2	0.0830	0.0830	
2	SITE 1	3	0.1060	0.1060	
2 2	SITE 1	4	0.0860	0.0860	
2	SITE 1	. 5	0.1010	0.1010	
3	SITE 2	. 1	0.0730	0.0730	-
3	SITE 2	2	0.1080	0.1080	
3	SITE 2	3	0.0790	0.0790	
3	SITE 2	4	0.0720	0.0720	
3	SITE 2	5	0.0750	0.0750	
4	SITE 3	1	0.0530	0.0530	
4	SITE 3	2	0.0740	0.0740	•
4	SITE 3	3	0.0730	0.0730	
	SITE 3	4	0.0830	0.0830	
	SITE 3	5	0.0810	0.0810	
5	SITE 5	1	0.0820	0.0820	
5	SITE 5	2	0.0760	0.0760	
5	SITE 5	3	0.0910	0.0910	•
5	SITE 5	4	0.0580	0.0580	
5	SITE 5	5	0.0690	0.0690	
6	SITE 8	1	0.0390	0.0390	
6	SITE 8	2	0.0650	0.0650	
6	SITE 8	3	0.0580	0.0580	•
6	SITE 8	4	0.0710	0.0710	
- 6	SITE 8	5	0.0500	0.0500	

CHAIN OF CUSTODY DOCUMENTATION



Severn Trent Laboratories, Inc.
208 South Park Drive, Suite I, Colchester, VT 05446 Tel: (802) 655-1203



CHAIN OF CUST RECORD

Report to:	Invoice to:	ANALYSIS REQUESTED Lab Use Only Due Date:
Company: Cowis Berges Group	Company: Louis Borger Group	REQUESTED / / / / / / Z
Address: 30 Viceland Rad Blog A	Address: So Vreeland Pund Blog A	Temp. of coolers when received (Cr):
Florham Park, NJ 07932		1 2 3 4
Contact: Tom Tanica	Contact: Tom Tunico	
Phone: 723-628 -1960 x 608	Phone: 573-678-1960	Custody Seal N / Y
Fax: <u>977-676 -356 Y</u>	Fax: <u>973 - 676 - 356</u> 4	
Contract/		Screened For Radioactivity
Quote:	Sampler's Signature	
Sampler's Name		108: NO49
	Dui Jalah	4 2/0/
Proj. No: Project Name	on Metal 12/1602 A	
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Severn Trent Laboratories, Inc. 208 South Park Orive, Suite 1, Coichester, VT 05446 Tel: (802) 555-1203



CHAIN OF CUSTODY RECORD

Report to: Company: Couis Berger Group Address: 30 Vreekend RD. RIGH Flo. hum Park us 0793 Contact Tom Tamico Phone: 923-678-1960 4 60P Fax: 727-676-3564 Contract/ Quole: Sampler's Name 2 Froi. No. Project Name	Address: 30 Vreelow W. Blbg. A Flor Lam Park, AJ 273 Conlact Ton Tunico Phone: 771-678-1960 x 608 Fax 973-676-3564 Sempler's Signature May Type of Containers:	when received (C): 1 2 8 3 4 5 Custody Seal N/Y Intacl N/Y Screened For Radioscanty	
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Marine WW - Westewater W - Water S 'Cocta vier 1004 - 40 ml Mal A/G - Artiber / Ov Gl	- Soil C - Liquid A - Air bag C - Charcoal ass) Liller 250 ml - Grass while mouth P/O - Pt	Tithe SL Sludge 0 - Oil STL pennat accept varied changes.	

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Severn Trent Laboratories, Inc.

208 South Park Drive, Suite 1, Colchester, VT 05446 Tel: (802) 655-1203

CHAIN OF CUSTODY RECORD

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Contact: Tom Tan, co			<u> </u>	· · · · · · · · · · · · · · · · · · ·	/ - / _ ,		/ /	1	1 1	
Phone: 971-678-(960x 608			<u>}</u>	/	- /: /		- I		/ /	• • •
	Fax: 975-6/6-	<u>- 755-</u>		/	1 /		. .		/	Screened
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		Appendix B			
	Sediment toxicity	testing - Chiron	nomus tentans		

REPORT CERTIFICATION

The following report titled "THE LOUIS BERGER GROUP, INC. MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – Chironomus tentans" is an accurate and truthful representation of the toxicity testing which was performed by American Aquatic Testing, Inc., located at 1105 Union Blvd. Allentown, Pennsylvania. We further certify that we have personally examined and are familiar with the information submitted in this document and based on our inquiry of those individuals immediately responsible for obtaining the information, we believe the submitted information is complete as presented. We are aware that there are significant penalties for submitting false information.

Christopher J. Nally

President, Laboratory Virector

Tarmo Pallop

Vice-President, Laboratory Manager

APPENDIX B

THE LOUIS **B**ERGER GROUP, INC. MATTEO IRON AND METALS SEDIMENT TO**X**ICITY TESTING – Chironomus tentans

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II.	Percent survival of <i>C. tentans</i> by replicate chamber and mean survival using control sample	6
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Data

Raw data for *Chironomus tentans* 20-day survival and growth test

Statistical data for *Chironomus tentans* 20-day survival using control sediment

Statistical data for *Chironomus tentans* 20-day growth test using control sediment

Chain of Custody Documentation

MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – Chironomus tentans

INTRODUCTION

During the month of August 2003, samples of sediment were collected from the Matteo Iron and Metals facility and surrounding area in Gloucester County, New Jersey. These sediment samples were used to perform toxicity tests to determine if the tested matrices represent a significant threat to potential receptor organisms.

The sediment samples from the study area were delivered to American Aquatic Testing, Inc. (AAT) and evaluated for toxicity using a 20-day solid phase exposure with the midge *Chironomus tentans* [1]. Following the exposure period, surviving test organisms from the sediments collected in the study area were compared to a control set tested under similar conditions using sediment of known environmental quality. The endpoints used for determination of an impact in the midge exposures were mortality, measured as mean survival, and growth, measured as mean dry weight.

MATERIALS AND METHODS / Chironomus tentans

Surface sediment samples were collected at stations adjacent to the Matteo Iron and Metals facility in Gloucester County, New Jersey. Station locations were selected to represent areas that may have been impacted by the facility's operations. Sediment samples were also taken at stations in the surrounding area for the purpose of making reference comparisons.

Preparation of sediment samples for testing

The sediment samples collected on August 18, 19 and 20 2003, were transported to the Severn Trent Laboratories facility in Edison, NJ and picked up by AAT personnel on August 21, 2003. Samples were collected in 2.5-gallon high-density polyethylene (HDPE) containers and transported on ice. Upon arrival at AAT on August 21, 2003, the samples were refrigerated until being used for testing on September 3, 2003. These samples were not altered other than to remove large debris and organic material (larger than ~3 cm) before testing.

Control sediment used to assess the health of the test organisms used for testing was collected from the Spruce Run Reservoir in Clinton, NJ on August 26, 2003 and was screened on-site using a #18 mesh screen to remove large debris and indigenous organisms. Screened sediment was placed in a five gallon HDPE container for transport to the laboratory and refrigerated until used for testing on September 3, 2003. Control sediment was analyzed for grain size, and total organic carbon (TOC) by Severn Trent Laboratories in Edison, NJ. The results of these analyses are included in Appendix A.

Test organisms

Study chironomids (*Chironomus tentans*) egg cases used to supply larval test organisms for the study were obtained from stock cultures maintained by Aquatic Biosystems, Inc. of Fort Collins, CO and were received in-house on September 3, 2003. Prior to testing, the organisms were held under conditions similar to that which they would encounter during the test (see Table I). The midges were not fed prior to test initiation. At the beginning of the 20-day exposure, the test organisms were <24 hours old. The age group used to conduct this test did however fall within the acceptable age range for this procedure [1].

A reference toxicant test using potassium chloride was conducted concurrently with the 20-day exposure to assess the sensitivity of the lot of organisms used in the sediment test. The 48 hr LC₅₀ produced was 2301.1 ppm. This test value falls within the range of the data set AAT is currently developing for this species. A copy of the raw data is included with the other raw data for this test in Appendix A.

Experimental procedures

The entire sediment exposure series for this project consisted of ten sediment samples from the study area and one of control sediment from Spruce Run Reservoir. Test chambers (300 mL tall form borosilicate glass beakers) were filled with 100 mL of sediment. 175 mL of test water was poured over the sediment gently to cause minimal disturbance. There were five replicate chambers for each station treatment. Test chambers were allowed to settle for 24 hours prior to test initiation.

After the settling period, the overlying water was siphoned off and fresh water was introduced, using a small, round HDPE disk suspended over the sediment to deflect the water flow and minimize disturbance to the sediment. Water quality data including alkalinity, ammonia, conductivity, dissolved oxygen, temperature, pH, and hardness were measured initially on composite water samples from all samples, prior to the introduction of test organisms, and at the end of the 20-day exposure for each sample and the control. Conductivity was also measured at 7 and 14 days in all samples and the control. The dissolved oxygen, pH and temperature were also measured initially and every 24 hours thereafter for the duration of the exposure for each sample and the control.

The exposure period began by placing 12 randomly selected test organisms into each chamber. Care was taken to ensure that the organisms were released beneath the surface of the overlying water to keep air bubbles from forcing the organisms to the surface. Test chambers were fed once a day during the exposure period with a slurry of dry fish flake food and deionized water to deliver approximately 4 mg/L to each chamber. Test conditions are summarized in Table I.

Observations were made and recorded for each chamber each day during the exposure period to assess organism health. Observations included the number of organisms dead, swimming, on the surface of the sediment or on the surface of the water. Dissolved oxygen, pH and temperature were measured and recorded each day from a new replicate chamber for each sample and the control. During the 20 days of the test, each chamber would be used for recordings four times. 150 mL of the overlying water was siphoned off twice a day and replaced using reconstituted water as a measure to maintain sufficient dissolved oxygen levels. Care was taken to minimize disturbance of the sediment during water renewal by using the small HDPE disc.

At the end of the 20-day exposure the final alkalinity, ammonia, conductivity, hardness, dissolved oxygen, pH and temperature were measured, and the test chambers were prepared for the removal of test organisms. With the overlying water present in each chamber, the top 20% of sediment was gently stirred into suspension. The slurry was then poured into a #60 mesh screen (250 µm) and rinsed in a shallow pan of laboratory water to remove the finer grains of the sediment. Sediment remaining in the sieve was placed into a second shallow pan of water over a light table, and carefully sorted to find the surviving test organisms. Using additional laboratory water, this process was repeated two or three times for each replicate until all the sediment had been inspected. All surviving organisms were transferred to a 30 mL soufflé cup for live count verification and preparation for weight determination. Pupae were counted for survival purposes, but were not included in the weight analysis.

When all test chambers had been sieved and the number of survivors verified, the test organisms were sacrificed using ethanol. The test organisms were then placed on tared aluminum weigh pans, which had been initially dried and weighed on September 23, 2003, dried for six hours at 105° C, and then transferred to a dessicator to cool before dry weight determination. Final dry weights were recorded on September 25, 2003.

Data analysis

Data analysis was performed following procedures published by the USEPA [1] using the Toxstat [2] data analysis software. Survival data, in the form of proportion of survivors in each chamber, was transformed by arcsine squareroot and then tested for normality using the Shapiro-Wilk's test or the Chi-Square test and for homogeneity of variance using Bartlett's test, as appropriate. Analysis of variance (ANOVA) followed by Dunnett's a posteriori pairwise comparisons or Steel's Many-One Rank test, as appropriate, to evaluate differences between stations and the control sample.

American Aquatic Testing, Inc.

TABLE I: Summary of Conditions for Chironomus tentans Toxicity Test

· .	·	
i.	Test type;	Whole sediment, static, daily renewal
2.	Temperature;	23.0 +/- 1.0 ° C
3.	Light quality;	Wide-spectrum fluorescent illumination
4.	Light intensity;	50 - 100 foot-candles
5.	Photoperiod;	16 hours light, 08 hours dark
6.	Test chamber size;	300 mL high form borosilicate glass beakers
7.	Sediment volume;	100 mL / replicate
8.	Overlying water volume;	175 mL / replicate
9.	Renewal;	2 volume exchanges per day
10.	Age of test organisms;	<24 hours
11.	Number organisms / container;	12
12.	Replicates;	5
13.	Feeding;	4.0 mg flake fish food / day
14.	Aeration;	None unless dissolved oxygen concentrations \leq 2.5 ppm, then \sim 100 bubbles / min.
15.	Overlying water;	Laboratory reconstituted water
16.	Test chamber cleaning;	Only if necessary
17.	Overlying water quality;	D. O., pH and temperature daily; alkalinity, ammonia, conductivity, hardness & pH at beginning and end of test, conductivity @ 7, 14, 21 days
18.	Test duration;	20 days
19.	Effects measured;	Survival and growth as mean dry weight
20.	Test acceptability;	Minimum control survival 70 %, minimum dry weight 0.6 mg

RESULTS

Effects on Survival / Control Sample

Raw data appear at the end of this Appendix. Data were arcsine square root transformed. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival of organisms in station sediments and the control sample.

Results from the analysis, which compared survival in station sediments with survival of organisms exposed to the control sample, are presented in Table II and at the end of this Appendix.

Of the ten stations in the study area, station 4 caused 100% mortality and was eliminated from analysis. Stations 8 and 9 did not produce mortality statistically different from the control exposure. Chironomids exposed to sediment from stations 1, 2, 3, 5, 6, 7 and 10 had significantly less survival than those exposed to the control treatment, and were not included in weight determinations.

It should be noted here that the recommended minimum control survival for chironomids in a 20-day exposure is 70% and this data set produced control survival of 66.7%. This decreased survival in the control may be an artifact of the handling procedures of the newly hatched test organisms during their placement into the test chambers. Since the <24 hour old midge larvae need to be sorted under a dissecting microscope to facilitate their removal from the egg case debris, they are not placed in an interim holding vessel prior to introduction to the test chambers. They are placed directly into the test exposure chambers and this limits the amount of observation time to replace those individuals that may have been adversely affected by handling. As the survival rates for the station samples are markedly lower than the controls, this slight depression in the control survival does not appear to have any adverse impact on the data analysis.

Table II. Percent survival of C. tentans by replicate chamber & survival comparison using control sample

Table II. To								· 1			
						Station				•	
Replicate	Control	1	2	3	4*	5	6	7	8	9	- 10
A	58.3	50	33.3	0	0	16.7	33.3	16.7	50	8.3	16.7
В	66.7	50	8.3	16.7	0	2 5	58.3	8.3	75	41.7	16.7
С	58.3	33.3	16.7	0	0	50	0	8.3	58.3	58.3	41.7
D	75	0	66.7	0	0	16.7	50	16.7	100	66.7	8.3
Е	75	0	0	8.3	0	16.7	2 5	33.3	66.7	33.3	33.3
Mean Survival	66.7	26.7	25	5	0	25	33.3	16.7	70	41.7	23.3
Statistically Different From Control		Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes

^{* -} Sample not included in ANOVA due to 100 % mortality

Effects on Growth / Control Sample

Raw data are presented at the end of this Appendix. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between growth of organisms in station sediments and the control sample.

Results from the analysis, which compared mean dry weights for stations 8 and 9 to the control sample, are presented in Table III and at the end of this Appendix.

Of the two stations that did not exhibit excessive mortality compared to the control sample, neither produced mean dry weights significantly different from the control exposure.

Table III. Mean dry weight (mg.) of C. tentans by replicate chamber & growth comparison using control

		Station	<u> </u>
Replicate	Control	8	9
A	0.789	0.583	1.98
В	0.768	0.550	0.516
С	0.670	0.624	0.579
D	0.450	0.515	0.650
E	0.48	0.695	0.998
Mean Dry Wt. – mg.	0.645	0.593	0.945
Statistically Different From Control	-	No	No

REFERENCES

[1] Ingersoll, C.G., G.A. Burton, T.D. Dawson, F.W. Dwyer, D.S. Ireland, R.A. Hoke, N.E. Kemble, D.R. Mount, T.J. Norberg-King, P.K. Sibley, and L. Stahl 2000 Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates EPA 600/R-99/064. U.S. Environmental Protection, Office of Science and Development, Duluth, MN

[2] Toxstat March, 1994 Version 3.4 data analysis software published by West, Inc. Western EcoSystems Technology, Inc., Cheyenne, WY

RAW DATA FOR *Chironomus tentans* 20-DAY SURVIVAL AND GROWTH TEST

Job Number: 173-01-01 Species: C. + en + 4 n 5 Beginning Date & Time: 9-3-03 1705 Ending Date & Time: 9-23-03 1800

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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Key: D=dead, N=normal activity, A=abnormal activity, B=No Observations

Comments:

Comments:

Job Number:	173-01-01
	T. tentans

Beginning Date & Time: 9-3-43 170 Ending Date & Time: 09-25-03 1800

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Comments:

Job Number: 173-01-01
Species: C. tentans

Beginning Date & Time: 9-3-43 1765 Ending Date & Time: 9-23-03 1800

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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Site	В	3	\$	B	8	B	13	B	В	В	13	В	B	B	8
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	Key: D=dead, N=normal activity, A=abnormal activity, B=No Observations														

Comments: 0 SC 5D 7 OUGONAETES 09/18/03

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Job Number:	173-01-01
Species: C	tentans

Beginning Date & Time: 9-3-03 1705 Ending Date & Time: 69-23-03 1800

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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6	D	8		B	B	B	В	B									6	
6	E	B	<u>B</u>	B	B	B	B	B						1 1			3	
	A	B	B	B	B	B	B	B			·						2]
Site	B	10	B		B	В	В	В					. <u> </u>			1 1/2 1/2		
3116	C	8	B B	B	ß	B	B	В		* .							1	
~	D	B		P		B	B	В					No.			1 2 1	_ ユ	
<i>*</i>	E	B	<u>B</u>	B	B	B	B	В									4	
		B	B	B	B	O	B	B									E]
Site	В	B	β	8	B	8	B	B									9	
DITE	C	B	B	B		B	B	B		21.51				1 Av. 1 1			7	
7	<u>D</u>	\mathcal{B}	B	B	B	8	B	8					<u> </u>	7.			10	
8	E	B B	8	B	3	N	B	B									8	<u> </u>
	A	B	<u></u> B	B	R	B	B	B										}
Site	B	B	\mathcal{B}	B	Ä	· G	\mathcal{B}	B					·	100	<u> </u>		Š	2
ンバセ	C	20		R	B	B	B	B					<u> </u>		ļ		7	1
9	D	B 2	<u>G</u>	B	B	8	B	B						ļ		ļ	8	1
ſ	E	B	B	A	B	Ğ	8	B		<u> </u>			·		<u> </u>		4	
Initia	1	790	TOP	1200	100	JO	1200	TAP	· ".						·		770	1
Date		9/17	0/12	alia	3/20	9/21	9/20	9/22				L		<u> </u>	L	L	9/23	J
Date		17.7	40 _	Karri D.	- doad	N-por	mal acti	vity. A=	abnorr	nal activ	vity B=	no obse	ervation	าร				

Comments: ① 12 09/23 64

Job Number: 173-01-01 Species: C Tentans Beginning Date & Time: 9-3-03 17-05 Ending Date & Time: 67-53-03 1800

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

								D	ay						40
Conc.	Rep.	0	1	2	3	4	5	6	7	8	9	10	11	12	13
	Α	3	B	15	78	15	B	B	13	6	<u>B</u>	<u>B</u>	A	B	B
	В	Ŕ	B	B	\mathcal{B}	<u>B</u>		B	B	B	<u> </u>	<u>B</u>	B	2	
Site	С	8	B	8	B	B	В В	B	B	B	3000	B	B	B	B
_	D	3	B	В	3	B		B	13	<u>B</u>	<u> </u>		3_	B	В
10	E	R	R	B	8_	B	B.	В	B_	B	15	В	8		<u> </u>
	Α								<u> </u>	ļ		<u>-</u>		<u> </u>	
1	В								<u> </u>	<u> </u>			<u> </u>		
	С									<u> </u>				ļ	
. \	D														
	E									<u> </u>	<u> </u>			 	
	Α									ļ					······
	В									<u> </u>				-	
	С								 	<u> </u>					
	D					<u> </u>								 	
	E								1	<u> </u>	<u> </u>			 	
	Α						·	·		 					
	В														· · · · ·
	С														· · · ·
	D								ļ					 ` ` ` 	
	Ε	<u></u>				<u> </u>			<u> </u>		!				
	A		<u> </u>	*.					 	+				<u> </u>	
(В			ļ	ļ					 					
	C		ļ		 				 	†		·			
,	D				-				 						
	E	(20	On	the	9/	SF	200	700	120	700	W	789	TAP	M	200
Initia		9/3	9/4	95	09/16	9/7	9/8	9/5	2/10	9/11	9/12	9/13	9/14	7/15	9116
Date	<u>e</u>	115		(A) D=	dood	Norr	nel ectiv		abnorn	nal activ		No Obs	ervatio	ns	

Comments:					
	·	 		_	

Job Number:	173-01-01	
	2. tentans	

Beginning Date & Time: 9-3-03 1705 Ending Date & Time: 9-13-03 1730

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

							OD.	36, 1 00.	O/ L . 10 0	• =						Day	/ 2 5 7
	ſ							D	ay					T 00	07	Observ	Final
Conc.	Rep.	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Observ	
<u> </u>	A	ß	В	B	В	B	\mathcal{B}_{-}	<u>8</u>						ļ. <u></u>		 	
Site	В	R	\mathcal{B}	B	В	B	R	B								 	2
)/TE	C	B	В	R	B	B		B									_ {
10	D	<u></u>	В	B	B	6	B	B								<u> </u>	
10	E	B	B	B	छ	8	B	В									4.
		<u> 5</u>	<u> </u>	 	 											<u> </u>	
	A			ļ			 								······································		
\ c	В					 	 							·		1:	
				ļ	 			 	-								
	D	· · · · · · · · · · · · · · · · · · ·		 	 												
	Ε			 	1			 			l l						
	Α		·	<u> </u>	<u> </u>		ļ					1		-			
	В	·····		 	<u> </u>	ļ											
	С	·					 			· · · · · ·	 						1. 11 1
\	D					ļ								<u> </u>			
	E			<u> </u>		<u> </u>		<u> </u>		·	 						
	Α								<u></u>		 	<u> </u>		<u> </u>	`	 	
\	В							<u> </u>		<u> </u>	 	ļ		ļ		 	
	O											<u> </u>				+	
\	D						ļ					<u> </u>		-		+	
,	Ε											-				+	
	A									· · · · · · · · · · · · · · · · · · ·	ļ.						ſ.
\	В							ļ			<u> </u>			 			
	C							<u> </u>			ļ	 	<u> </u>	 	<u> </u>		1. 1.57
	D								<u> </u>				<u> </u>				
	E							<u> </u>				<u> </u>				+	~~~
Initia		7790	TOP	TOP	7000	JE	Tapo	TAD						ļ			700 9/2
Date		709	6/2	alia	9/30 = dead.	[9]	9/22	9/22			<u> </u>	<u> </u>		<u> </u>		<u> </u>	4/2

	N	9/19 9/30 9 21 9 ey: D=dead, N=norma		•	<u> </u>		
ommen <u>ts:</u>						·	
·					1		
····					100		

Client/Toxicant:	173	
Project Number:	01-01	
Species 🗸 💆	teatail	

Beginning Date & Time: 9-3-03/7-5Ending Date & Time: 9-3-03/800Hatch Date: 9-03-03

American Aquatic Testing, Inc.
Weight Data

			<u> </u>	weign	it Data		<u> </u>	
			Α	В	(B-A)*1000=C	D.,	. C/D	C/E
	ļ		weight of	weight of	dry weight of	# of	mean dry	IC23 & NOEC
}		Pan	boat	boat & org.	organisms	surviving	weight	cale. weight
Cone.	Rep	#	(g)	(g)	(mg)	org.	(mg)	(mg)
	Α		0.01140	0.016	5,52	7	0.789	
[В	2	0.01227	0.01841	6.14	8	0.768	
	С	3	0.01025	0.01494	4,69	7	0.670	x 0.645
α	D	4	0,00952	0.0/357	4.05	Q	0.460	
Control	E	5	0.01242	0.0/735	4.93	9	0.548	
Control	K							
	Ø							·
	¥							
	Α	6	0,01111	0.01397	9.86 93.08	16	0.477	
	В	7	0.01079-	0.1387	V 3.08	6	0.513	× 0.359
Site	С	8	0.00821	0.00856	0.35	4	0.088	0.216
7/1C	D	9	0.00985	~	-	0		
	E	10	0.00942	_	_	0		1
1	K							
1	B.							
	Ħ	<u></u>						
	Α	11	0,00991	0,01286	2.95	14	0.738	
Site	В	12	0.00995	0,01230	2.35		0. ②	x 1.113
DITE	С	13	0.00904	0,01056	1.52	8	0.760	3,914
	D	14	0.00958	10.01537	5.79	8	0.734	
2	E	15	0.00896			0		
2	下	ļ						
	G		_	ļ	<u> </u>	ļ		
	H	<u> </u>	100:00	<u> </u>	<u> </u>		<u> </u>	
	A	16	0.01001	-	-	2	- 3	
Site	В	17	0.00935	0,00996	0.61	12	0.305	
, , ,	C	18	0.00893		-	0		X 0.398
	D	19	0.00751			0	- 70	9.159
3	E	20	0.00975	0.01024	0.49		0.490	
)	X		ļ	·	 	 	 ,	
	B			 	 	<u> </u>	 	
	H	liole.	+ 1	1	1	1 01	1	1
		tials	10/23	1 10/2-	1 /2/	18/100	18/1-	19/
		ate	109/23	09/25	08/25	0463	08/25	ेश्वर

E = Original number of organisms at test initiation, adjusted for losses.

Observations:	1 0.0138	377 Wala663	•
	2.35	3	

Client/Toxicant:	173	· ·
Project Number:	01-01	
Species:	tentans	

Beginning Date & Time: 9-3-3 17-5 Ending Date & Time: 09-23-3 1800 Hatch Date: 09-03-3

American Aquatic Testing, Inc. Weight Data

			A B (B-A)*1000=C D C/D							
1			weight of	weight of	dry weight of	# of	mean dry	IC25 & NOEC		
		Pan	boat	boat & org.	organisms	surviving	weight	cale. weight		
Cone.	Rep	_#	(g)	(g)	(mg)	org.	(mg)	(mg)		
	Α	21	0.00944			0	-			
. [В	22	0,01/01	-	_	0				
Site	С	23	0.01045	_		0	_	X O		
<i>)</i> () C	D	24	0,0 1190		_	0	-			
	E	25	0,01005	 .		0				
4	F									
ľ	G							<u> </u>		
	Н									
	Α	26	0.01095		3.04	2	1.52			
	В	21	0.01113,	0,01411	3.17	3	0.993	x 0.867		
Site	С	28	0.01024	0.01341	3.17	2	0.528			
	D	29	0,01061	0.011.77	1.110	2	0.580			
	Ε	30	0,00424	0.01072	1.43	2	0.715	ļ		
>	F					<u> </u>				
)	G						<u> </u>			
	H		0					<u> </u>		
	A	3/	0.00929		2.46	4	0.613	 		
	В	32	0.0400	D.01430	4.91	7	0.701	X 0.601		
Site	C	33	0.00952		-	0	0.530	0.481		
	D E	34 35	0.00857	0.01179	3.22	3	0.537			
	F	35	0,07006	0.01172	1.66		0.663			
6	G	 	 	 		·				
	Н	-	·							
	A	36	00/055	0.01246	1.91	12	0.965	+		
(B	37	0.00972	0.01156		100		x 1.436		
Site	C	38	0,00931	0.01072	1,07	 	1.840	X 1.400		
	ā	39			3.81	2	1.410			
$\overline{}$	E	40	001020	0.0/445	3.01	4	1.910			
+	F	1 70	70,000	0.07773	-	+-7-	1.405			
	G	+		 		+	+			
1	H	+	 	 	 		+	+		
		tials	1 8/1	3/	† 0/	10/	10/	+0/-		
	1	ate	09/28	39/35	16/55	69/22	69/35	08/38		
			1 2 2 2		at test initiation	1000	1 UMA	140		

E = Original number of organisms at test initiation, adjusted for losses.

Observations:	(1) 0.01105	208/23 C/	•	
	D 0.00954	17		

Client/Toxicant:	173	
Project Number:	01-01	
Species:	tentans	

Beginning Date & Time: 9-3-3/7 Ending Date & Time: 9-3-3/8 Hatch Date: 9-3-3

American Aquatic Testing, Inc.
Weight Data

Weight Data										
	Ī		Α	В	(B-A)*1000=C	D	C/D	C/E		
			weight of	weight of	dry weight of	# of	mean dry	IC25 & NOEC		
	1	Pan	boat	boat & org.	organisms	surviving	weight	calc weight		
Cone.	Rep	#	(g)	(g)	(mg)	or g .	(mg)	(mg)		
	Α	4/	2.00926	0,01276	<i>3.5</i> 0	6	0.583			
	В	42	0.01050		4.95	9.	0.550	£ 0.583		
Site	С		0,01002		-4.32 O	7	0.624			
7176	D	44	0.01081	0,01699	6.18	12	0.515			
	E	45		0,01565	5.56	8	0.695			
8	A						٠.			
U	G				,		·			
	H									
	Α	46	0,00994	0,01192	1.98		1.98			
	В			0,01443	4.13	5	0.516	x 0.945		
Site 9	С	47	0.00964	0.01364	4.05		0.579			
	D	49	0.00876	0,0/396	5.20	8	0,650			
0,	E	49 50	0,00999	0.01396	3,99	4	0.998			
9	K									
'	Ø						,	<u> </u>		
	Я	<u> </u>	<u> </u>	<u></u>		<u> </u>	<u> </u>	<u> </u>		
	A	51	0.00991	0.01132	1.41	2	0.765			
	В	53	0,00891	0,01049	1.68	2	0.199	₹0.693		
Site	С	53,	0,01030	0.01363	3.33,	5	0,666			
	D	64	0,0/043	0.01067	0.24	1/	0,20	<u> </u>		
10	E	66	0,00933	0.01359	4,26	4	1.065			
10	75	 	<u> </u>		<u> </u>	 	*			
	3	 -				· ·	<u> </u>			
	14	 	 	 	 	 	 	 		
	A	 	 	 	 	 				
1	B	 		 	 	 	<u> </u>			
\	D	 	 	<u> </u>	 		<u> </u>			
\	E	-		 		 	 			
\	F		 	<u> </u>	 	 -	 			
\	G	 	 	 	 		 	 		
	H	-	+	 	 	+	 	 		
		⊥ tials	+ /	1011	+ //-	1/1/	100	+ 0/-		
	11	ate	69/23	39/25	09/25	1 1 9 m	109/20	Han		
		ale E = Or		1 31/00	1 Ollav	1 9/23	109138	1 VIJAO		

E = Original number of organisms at test initiation, adjusted for losses.

Observations:	,		
<u> </u>	09/25/302		
	Towns 11		

Client/Toxicant:	173
Job Number:	01-01
Species: C	tentans.

Be ginning Date & Time:_	9-3-03	1705
Ending Date & Time:		

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

							Day					
Parameter	Concentration	0	1	2	3	4	5	6	7.	8	9	10
	Control	23.c	22.0	22.0	22.0	220	22,0	220	22.D	22,c	SZ 0	22.0
	Site 1	23.c	22.0	22.0	27.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
T	Sitez	23.c	33	220	22.0	22.0	22.0	22.0	20.0	22.0	72.0	27.0
Ε	Site3	23.c	32.0	22.0	22.0	22.0	22.0		22.0	22.0	220	22.0
М	Site4	23.c	22.0	220	220	22.0	22.0	22.0	22.0	22.0	22.0	27-0
P	Sites	23.0	22.0	220	22.0	22.0	22.0	22.0	28.0	22,0		32.0
	Site 6	23.0	33.0	22.0	220	22.0	22.0	22.0	22.0	22.0	22.0	22.0
(C)	Site7	23.0	33.5	72.0	270	22.0	22.0	22.0	22. O	22.0	22.0	22,0
	Site8	23.0	37.0	220	22.0	22.0	22.0	22.0	22.0		22.0	22.0
	Site9	23.0	33.3	22.0	220	22.0	22.0	22.0	32.0	22,0	<u> </u>	€ J.O
	Site 10	23.0	133.0	220	220	22.0	122.0	77.0	22.0	22.0		22.0
	Control	6.7	0.6	7.2	608	7.3	6.2	6.8	6.9	6.6	7.4	6.5
	Site1	6.9	6.8	7.4	7,6	7.7	6.8	7.1	7.3	7.0	7-6	7.1
	Sitea	6.7	6.9	7.6	7.5	7.8	6.8	7.3	7.a	7,1	1.8	7.3
Dissolved	Site 3	6.0	6.4	7.10	6.3	69	5.9	7.0	6.0	5.8	6.2	5.4
Oxygen	Site 4	5.1	6.7	7.5		7.5	6.4	6.8	17.0	6.6	7.5	7.0
	Sites	4.9	6.7		129	7.2	6.4	6.8	G.0	6.6	7.5	7.0
(mg/L)	Site 6	5.9	66	7.5	7.0	7.3	6.4	6.8	6.8	6.6	7.4	7.0
	Site 7	5.0	6.5		6.7	7.4	6.4	6.9	6.9	6.5	7.5	7.0
	Site8		6,5			7.4	6.4	7.1	6.7	6.7	7.5	7-0
	Site9	5.5	6.5	7:60		7.4	6.4	7.1	(0.7	6.6	7.3	7.0
	Site	5.8	6.7	7.6	7.2	- 1.0	6.4	7.1	6.8	6.9	F.F	7-0
	Control	7.3	7.3	7.7	74	7.7	1.7	7.8	7.8	7.8	8.0	7.9
	Site 1	7.3	7.3	7.7	7.7	7.8	7.6	7.6	7.8	7.8	7.9	7.9
	Site 2	17.3	1.5	7.7	+그:7	78	7.6	7.5	138	7.7	17.8	79
	Site3	7.7	73	17.7	17.6		7.5	7.5	11.1	7.6	1.8	7.6
-101	Site 4	7.2	7.3	17.7	<u> </u>		17.5	7.5	7.7	7.6	7.1	7.7
pН	Sites	7.2	7.2	13.7	20	4 4	11.3	7.5	13.7	7.6	8.5	7.8
	2	7.2	7.4	1.7	1 7 3	7.8	152	1	7.7	7.6	7-8	7.8
	Site t	12/2	7.7	7.7	77	7.8	1-1-1	7.6	17.1	7.7	7 7.8	7.8
	Site9	7.2	7.4	7.7	1-13	7.8	1.5	7.6	7.7	7-7	-	7.8
	Site		7.4	7.7	17 7 7	1-7.8	157	150	17.7	- 7.7	7.5	7.8
L	Initials	72	92	-1100	135	176	10	mi	MO	123	inp	1990
	Date	19/3	17/4	195	19/6	9/7	9/8	1979	9/10		9/12	9/13
	-,					7 .						

	Cond. (umhos)	Aikalinit	r (mg/L)	Hardnes	s (mg/L)	Ammoni	a (mg/L)	Comments: Day 7
Concentration	Initial	Final	Initial	Final	Initial	Final	Initial	Final	
Control	275	275	60	70	80	110	0.04	0.01	
Site 1	275	275	70	60	70	110	0.00	0.00	
Sitel	275	275	70	70	80	100	O.0c	0.00	
Site 3	275	275	60	70	80	100	0.10	0.00	
Site4	275	380	60	60	80	100	0,00	0.00	
Sites	280	270	70	70	7c	90	0.13	0.02	
Site 6	270.	270	60	70	70	100	_	0.00	
Site 7	280	380	70	70	80	90	0.16	0.01	
Site 8	280	275	70	70	80	110	0-15	0.00	
Site9	2.80	275	70	70	80.	110	0.23	0.00	
Site lo	270	380	50	60	80	100	0.09	0.00	,
Initials	久上	NP	1. D.	2	942	75D	92	114	
Date	1973	7/10	9/3	9/23	9/3	9/23	973	9/23	

FWSEDPAR.wk3

Client/Toxicant:	173
Job Number:	01-01
Species (2 tentans.

Beginning Date & Time:	9-3-03	1705
Ending Date & Time:		

Freshwater Sediment Test American Aquatic Testing, Inp., Physical / Chemical Parameters

	j						Day					
Parameter	Concentrationi]]	12	13	14	15	16	17	18.	19	20	2 1
	Control	23.0	22.0	23.0	220		22.0	23.0	22.0	23.0	22,5	
ļ	Site 1	23.0	20.0	23,0	370	25.56	22.0	23.0	22.0	23-5	22.5	
T	Site 2	23.0	22.0	23.0	92.0	22.5	22.0	ا نا (ج	22.0	23.0	·23.0	
Ε	Site3	23.0	22.0	23.0	S. 66	22.5	22.0	23.0	22.0	23-0	225	
М	Sitey	23.0	22.0	23.0	22.0.	22.5	22.0	23.0	220	23.0	22.0	
P	Sites	23.0	22.0	22.5	23.0	22.5	22.0	23.0	220	23.0	23.0	
	Sileb	23.0	22.0	ZZ 5	24.0	22.5	22.0	23.0	22.0	1.0	22.0	
(C)	Site 7	73.0	22.0	225	29.0	22.5	22.0	23.0	22.0	23.0	22.0	
.	Site 8	23.0	22.0	22.5	27-0	22.5	22.0	73.0	22.0	23.0	22.0	
1	Site9	23.0	22.0	225	29.0		22.0		1220	23.0		
	Sitelo	23.0	22.0	225	32.0	122.5	22.0	23.0	22.0	7300	22.0	
	Control	6.8	6.8	6.7	6.8	6.9	6.7	6.9	6.2	6-0	6.3	
1	Site 1	7.3	6.F	6.9	71	6.9	7.3	17.2	6.3	16.2	6.7	
	Sitea	7.5	7.3	7.1	7.3	7.1	7.3	7.0	ال ما		6.9	
Dissolved	Site 3	5.6	15.8	6.1	6.4	6.0	16,2	15.8	6.		5.3	
Oxygen	Site 4	74	16.7	6.7	6.1	6.9	68	6.9	<u>(64</u>		6.7	
	Sites		67	6,5	6.9	6.9	6.2	6.6	5.2	- 1 1 N	5.7	
(mg/L)	Site 6	7.3	6.6	6.3	6.6	6.8	6.1	6.5	lo C	14.8	5.7	
	Site	7 72		6.2	6.7		6.5	69	150	5.6	6.4	
	Site 8	7.		6.4	6.9	6.8	7.0				6.1	-
١. ا	Site 9			6.4	170		6.4	6.6		15.4	6.2	-
-	Site		2 + +.0		7-0		1-1-1	1,0		213.7	7.0	
	Control	7.			1	7 7 8	157	7.8	7,5		16	
	Site				77	7 7-8	(-18)	78	1.	1 7.6	47	
	Site	7.			- 	7.7	7.9	77	7-	1 50	7/1.6	-
-	Site	7 7			7.4			7.7	1-5	5 3 X	7.6	
рН	Sites	7						78	1 -/-	1 2	2 7.6	
	Site	7		7.6				7.9	1 7	777	7.6	
	Site	7 7.			7.			7.9		3 7.	7.6	<u> </u>
	Site	P 7			7,			1 7-		8 7.		<u>-</u>
	4	9 7			7,				7.8			,
	Site			5 7.5	7,	7 7.8	7.9	7.8	7,	8 7.6	<i>-</i>	
	Initials			9	1704		93			TA		
•	Date	19/	14 1 911	5 7/10	9/	719/1	2 19/19	19/2	0 9/	21 9/3	1772	3

	Cond. (umhos)		Alkalinity (mg/L)		Hardnes	s (mg/L)	Ammoni	a (mg/L)	Comments: O Dlay 14	,
Concentration	tnitiet	Sinal	Initial	Final	tnitiat	Final	Initial	Final	@Day 21	
Control	280	290							7	
Site1	780	285				·				
Site 2	280	290			·					
Site 3	280	290							•	
Site 4	280	285		Ī						• .
Sites	275	300			. /	÷				
Siteb	275	290				/				
Site 7	280	295								
Site 8	270	290							· · · · · · · · · · · · · · · · · · ·	
S.te9	270	290			. 1					
Site 10	230	285								
Initials	1000	25				· · · · · · · · · · · · · · · · · · ·				
Date	9/17	19/23	l	<u></u>	<u> </u>					

FWSEDPAR.wt)

Job Number:	173-01-01
Species: C.	tentans

Sample sieve date/by:_

Sieve size used:

Start Date & Time:_	9-3-03	1705
End Date & Time:		

Test Duration: 20 day 5

Test Temperature Range: 23±12

Sediment Test

American Aquatic Testing, Inc.,
Water Change Log/Initial Water Readings/General Testing Information

Test Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Morning change(time)		950	1020	0930		0920		<u>e</u> 8∞	0745		0700			0800	0745
D.O. mg/L	76	75	8.0	22	82	7.2	8.4	8.6	8.0	8,6	3.4	8.2	8.7	8.6	8.5
pH	7.4	8.0	7.9	7.9	8.3	7.8	8-2	-89-202		84	8.1	8.0	8.1	8.1	8.2
Temp. (C)	24.0	24.0	24-0	23.0		23.0	22.0	22.5		23,0	23.0	37.2	22.5	22,5	22.5
Initials	me	me	2	My	JL	no	700	36	78	JF_	7020	706	JE	JF	JC
Date	93	714	95	0906			9/9	वाठ	9/11	912	9/13	9/14	19/12	916	9/7
Afternoon change(time)		1730	1700		1430	1630	1610	1610		1700		1730	1800	1710	1800
D.O. mg/L	7.6	7.6	8.3	8.5	8.7	7.9	8.4	8.2	8.2	8.5	8.2	8.1	8.1	800	8.4
рН	7.6	7.9	7,0	8.3	8.3	7.8	7.6	7,6	7.7	8.1	79	7.9	7.9	7.9	8.0
Temp. (C)	23.5	22.5	22.0	22.0	72.0	23,5	22.0	22.5	22.5	22.5	22.5	23.5		23.5	23.0
initials	7	7880	JC	JC	JF		OND		*	JF	700	780	and-	4D	7000
Date	9/3	9/4	915	96	3400	9/8	9/9	9/10	7/11	9/12	9/13	9/14	9/15	9/16	9/17
Test Day	15	16	17	18	19	20	21	22	23	24	- 25	.26	27	- 28	
Morning change(time)	0730	0900	င%	0900	0745	0930									
D.O. mg/L	3,2	8.6	8,3	8.4	80	8.0									
рН	8.2	8,2	81	8.2	8.0	7.9							·		
Temp. (C)	22,5	22.0	32,5	220		220									
Initials	76	UF	2/_	16	JP	9/									
Date	9118	919	09/20	9/21	9/22	69/23						·			
Afternoon change(time)	1700	(800	1230	1930	17c0										
D.O. mg/L	82	4,9	8-2	8.1	7.9										
рН	7.8	7.7	7.9	7.8	8.0										
Temp. (C)		22.0		22.0											
Initials		92 D	JE		72										
Date	9/18	9/19	9/20	09/21	9/22						<u> </u>				
Control Sed. collection date/by: 8-26-03/TAPQ— Organism source: ABS Inc. Test Chamber size: 300m/															
Control Sed. sieve date/by: 8-26-03/45 Test organism Lot number: 640 Test Volume of sediment: 100 m /															
Sieve size used: 18	Sieve size used: 18 Number of animals per chamber: 12 Test Volume of water: 175m/														

Food Type: Tetramin Slurry

Frequency of feeding: 1 × a da

09/7 @ 812 JF 9/10

STATISTICAL DATA FOR *Chironomus tentans* 20-DAY SURVIVAL USING CONTROL SEDIMENT

```
Matteo Metals C. tentans surv. start date 09/03/03
File: D:\TOXSTAT\1730101C.TSU Transform: ARC SINE(SQUARE ROOT(Y))

piro - Wilk's test for normality

D = 2.030
W = 0.971

Critical W (P = 0.05) (n = 50) = 0.947
Critical W (P = 0.01) (n = 50) = 0.930

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals C. tentans surv. start date 09/03/03
File: D:\TOXSTAT\1730101C.TSU Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated Bl statistic = 11.34

Table Chi-square value = 21.67 (alpha = 0.01, df = 9)
Dle Chi-square value = 16.92 (alpha = 0.05, df = 9)
```

Data PASS Bl homogeneity test at 0.01 level. Continue analysis.

Matteo Metals C. tentans surv. start date 09/03/03

File: D:\TOXSTAT\1730101C.TSU Transform: ARC SINE(SQUARE ROOT(Y))

File: D:\TOXSTAT\1730101C.1

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	5	0.869	1.047	0.958
2	SITE 1	5	0.145	0.785	0.495
3.	SITE 2	5	0.145	0.956	0.486
4	SITE 3	5	0.145	0.421	0.230
5	SITE 5	5	0.421	0.785	0.514
6	SITE 6	5	0.145	0.869	0.588
, · 7	SITE 7	5	0.292	0.615	0.408
- 8	SITE 8	5	0.785	1.426	1.017
9	SITE 9	5	0.292	0.956	0.687
10	SITE 10	5	0.292	0.702	0.490

Matteo Metals C. tentans surv. start date 09/03/03

File: D:\TOXSTAT\1730101C.TSU Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1:	Control	0.008	0.089	0.040	9.32
2	SITE 1	0.107	0.327	0.146	66.09
3	SITE 2	0.099	0.314	0.141	64.72
4	SITE 3	0.016	0.125	0.056	54.28
5	SITE 5	0.025	0.158	0.071	30.69
6	SITE 6	0.080	0.282	0.126	48.07
7	SITE 7	0.018	0.132	0.059	32.41
8	SITE 8	0.062	0.249	0.111	24.47
9	SITE 9	0.067	0.258	0.115	37.58
10	SITE 10	0.027	0.165	0.074	33.71

Matteo Metals C. tentans surv. start date 09/03/03

File: D:\TOXSTAT\1730101C.TSU Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

		<i>(</i> .		
SOURCE	DF	SS	MS	F
Between	9	2.624	0.292	5.746
Within (Error)	40	2.030	0.051	
Total	49	4.654		
		- 		

Critical F value = 2.12 (0.05,9,40)

Since F > Critical F REJECT Ho: All equal

Matteo Metals C. tentans surv. start date 09/03/03

File: D:\TOXSTAT\1730101C.TSU Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <treatment< th=""><th></th></treatment<>		
GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	sig
	Control	0.958	0.667		
2	SITE 1	0.495	0.267	3.246	*
3	SITE 2	0.486	0.250	3.311	*
4	SITE 3	0.230	0.050	5.110	*
5	SITE 5	0.514	0.250	3.110	*
6	SITE 6	0.588	0.333	2.597	*
7	SITE 7	0.408	0.167	3.855	*
. 8	SITE 8	1.017	0.700	-0.415	
9	SITE 9	0.687	0.417	1.900	
10	SITE 10	0.490	0.233	3.280	*

Dunnett table value = 2.51 (1 Tailed Value, P=0.05, df=40,9)

Matteo Metals C. tentans surv. start date 09/03/03

File: D:\TOXSTAT\1730101C.TSU Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	OF 2 Ho	Ho:Control <treatment< th=""></treatment<>		
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	5			
2	SITE 1	5	0.350	52.5	0.400
	SITE 2	5	0.350	52.5	0.417
-4	SITE 3	5	0.350	52.5	0.617
5	SITE 5	5	0.350	52.5	0.416
6	SITE 6	5	0.350	52.5	0.333
7	SITE 7	5	0.350	52.5	0.500
8	SITE 8	5	0.350	52.5	-0 033

TLE:

Matteo Metals C. tentans surv. start date 09/03/03

LE: D:\TOXSTAT\1730101C.TSU

TRANSFORM: ARC SINE (SQUARE ROOT (Y)) NUMBER OF GROUPS: 10

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Control	1	0.5830	0.8688
1	Control	2	0.6670	0.9557
1	Control	3	0.5830	0.8688
. 1	Control	4	0.7500	1.0472
. 1	Control	. 5	0.7500	1.0472
2	SITE 1	1	0.5000	0.7854
2	SITE 1	2	0.5000	0.7854
, 2	SITE 1	3	0.3330	0.6151
2	SITE 1	4	0.0000	0.1448
2	SITE 1	5	0.000	0.1448
3	SITE 2	1	0.3330	0.6151
3 3 3 3	SITE 2	2	0.0830	0.2922
3	SITE 2	3	0.1670	0.4210
3	SITE 2	4	0.6670	0.9557
	SITE 2	5	0.0000	0.1448
4	SITE 3	1	0.0000	0.1448
. 4	SITE 3	2	0.1670	0.4210
4	SITE 3	3	0.0000	0.1448
	SITE 3	4	0.0000	0.1448
	SITE 3	5	0.0830	0.2922
5	SITE 5	1	0.1670	0.4210
.5 5	SITE 5	2	0.2500	0.5236
	SITE 5 SITE 5	. 4	0.5000	0.7854 0.4210
5	SITE 5	5	0.1670	0.4210
5 5 6	SITE 6	1	0.3330	0.4210
6	SITE 6	2	0.5830	0.8688
6	SITE 6	3	0.0000	0.1448
6	SITE 6	4	0.5000	0.7854
6.	SITE 6	5	0.2500	0.5236
7	SITE 7	1	0.1670	0.4210
7	SITE 7	2	0.0830	0.2922
7	SITE 7	3	0.0830	0.2922
7	SITE 7	4	0.1670	0.4210
7	SITE 7	5	0.3330	0.6151
8	SITE 8	1	0.5000	0.7854
8	SITE 8	2	0.7500	1.0472
8	SITE 8	3	0.5830	0.8688
8	SITE 8	4	1.0000	1.4260
8	SITE 8	5	0.6670	0.9557
9	SITE 9	1	0.0830	0.2922
9	SITE 9	2	0.4170	0.7020
9	SITE 9	3	0.5830	0.8688
9	SITE 9	4	0.6670	0.9557
	SITE 9	5	0.3330	0.6151
10	SITE 10	1	0.1670	0.4210
10	SITE 10	2	0.1670	0.4210
10	SITE 10	3	0.4170	0.7020
10	SITE 10	4	0.0830	0.2922
10	SITE 10	5	0.3330	0.6151

STATISTICAL DATA FOR *Chironomus tentans* 20-DAY GROWTH

USING CONTROL SEDIMENT

Matteo Metals C. tentans grow. start date 09/03/03 e: d:\toxstat\l730101C.TGR Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	5	0.450	0.789	0.645
2	SITE 8	5 .	0.515	0.695	0.593
3	SITE 9	5	0.516	1.980	0.945

Matteo Metals C. tentans grow. start date 09/03/03
File: d:\toxstat\1730101C.TGR Transform: NO TRANSFORMATION

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %	
1	Control	0.021	0.145	0.065	22.46	
2	SITE 8	0.005	0.070	0.031	11.74	
3	SITE 9	0.370	0.608	0.272	64.37	

Matteo Metals C. tentans grow. start date 09/03/03

File: d:\toxstat\1730101C.TGR Transform: NO TRANSFORMATION

A-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED OBSERVED	1.005 0	3.630 6	5.730 5	3.630	1.005

Calculated Chi-Square goodness of fit test statistic = 2.7547 Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Matteo Metals C. tentans grow. start date 09/03/03

File: d:\toxstat\1730101C.TGR Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance Calculated B1 statistic = 14.80

ble Chi-square value = 9.21 (alpha = 0.01, df = 2) Table Chi-square value = 5.99 (alpha = 0.05, df = 2)

Data FAIL Bl homogeneity test at 0.01 level. Try another transformation.

Matteo Metals C. tentans grow. start date 09/03/03

e: d:\toxstat\1730101C.TGR Transform: NO TRANSFORMATION ANOVA TABLE

SOURCE	DF	SS	MS	F
			, ,	
Between	2	0.360	0.180	1.364
Within (Error		1.582	0.132	
Total	14	1.942		
				

Critical F value = 3.89 (0.05,2,12) Since F < Critical F FAIL TO REJECT Ho: All equal

Matteo Metals C. tentans grow. start date 09/03/03

File: d:\toxstat\1730101C.TGR Transform: NO TRANSFORMATION

	DUNNETT'S TEST - TA	HO: Control <treatment< th=""></treatment<>			
CROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
	Control	0.645	0.645		
2	SITE 8	0.593	0.593	0.225	
3	SITE 9	0.945	0.945	-1.305	

Dunnett table value = 2.11 (1 Tailed Value, P=0.05, df=12,2)

Matteo Metals C. tentans grow. start date 09/03/03

File: d:\toxstat\1730101C.TGR Transform: NO TRANSFORMATION

	DUNNETT'S TEST -	TABLE 2		:Control<	Treatment
GROUP		NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)		DIFFERENCE FROM CONTROL
1	Control	5			
2	SITE 8	5	0.485	75.1	0.052
3	SITE 9	5	0.485	75.1	-0.300

Matteo Metals C. tentans grow. start date 09/03/03 d:\toxstat\1730101C.TGR

TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 3

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Control	1	0.7890	0.7890
1	Control	2	0.7680	0.7680
1	Control	3	0.6700	0.6700
1	Control	4	0.4500	0.4500
1	Control	5	0.5480	0.5480
2	SITE 8	1	0.5830	0.5830
2	SITE 8	2	0.5500	0.5500
2	SITE 8	3.	0.6240	0.6240
2	SITE 8	4	0.5150	0.5150
2	SITE 8	5	0.6950	0.6950
3	SITE 9	1	1.9800	1.9800
3	SITE 9	2	0.5160	0.5160
3	SITE 9	3	0.5790	0.5790
3	SITE 9	4	0.6500	0.6500
3	SITE 9	5	0.9980	0.9980

CHAIN OF CUSTODY DOCUMENTATION



Severn Trent Laboratories, Inc.
208 South Park Drive, Suite 1, Colchester, VT 05446 Tel: (802) 655-1203



CHAIN OF CUST RECORD

Report to: Company: Cours Bener Group Address: 30 Vaceland Roll Blight Flo-ham Park, UT 07932 Contact: Tom Tanica Phone: 923-678-1960 x 608 Fax: 927-676-356 Y Contract/ Quote:	Contact: <u>To-~ Tani</u> Phone: <u>923-628-</u> Fax: <u>923-626-</u>	c 600 y S Puss Eurk, N co -1960	Blog A	Analysis Requeste				Lab Use Only Due Date: Temp. of coolers when received (C*): 1 2 3 4 Custody Seal N / Y Intact N / Y Screened For Radioactivity
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	Soil L Liquid A - Al ss I Liter 250 ml - Glass wide REC D' FE	e mouth	- Charcoal To P/O - Plas ICAN AS	tic or other	Sludge) 011 08/21/03		cannot accept verbal changes. case Fax written changes to (802) 655-1248

Severn Trent Laboratories, Inc. 208 South Park Orive, Suite 1, Colchester, VT 05446 Tel: (802) 655-1203



CHAIN OF CUSTODY RECORD

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Report to:	Invoice to:		ANALYSIS	I = I = I	Lab Use Only Oue Date:	
Company: Louis Berger Group	Company: Louis Berge		REQUESTED	///////		
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Florham Park, WI 0793	Flortram Park	NJ 028	k. /			
Contact Tom Tanico	Contact Ton Tunica	<u> </u>		A + A + A		5
Phone: 973-678-1960 160P	Phone: 771-678-19		/ /·		Custody Seal M / Y Intact N / Y	1
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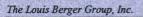
Severn Trent Laboratories, Inc. 208 South Park Drive, Suite 1, Colchester, VT 05446 Tel: (802) 655-1203

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Appendix C

Sediment toxicity testing - Chironomus tentans Emergence

REPORT CERTIFICATION

The following report titled "THE LOUIS BERGER GROUP, INC. MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – *Chironomus tentans* EMERGENCE" is an accurate and truthful representation of the toxicity testing which was performed by American Aquatic Testing, Inc., located at 1105 Union Blvd. Allentown, Pennsylvania. We further certify that we have personally examined and are familiar with the information submitted in this document and based on our inquiry of those individuals immediately responsible for obtaining the information, we believe the submitted information is complete as presented. We are aware that there are significant penalties for submitting false information.

Christopher J. Nally

President, Laboratory Director

Tarmo Pallop

Vice-President, Laboratory Manager

APPENDIX C

THE LOUIS BERGER GROUP, INC. MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – Chironomus tentans EMERGENCE

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V. Total survival of <i>C. tentans</i> by station using station 8 & 9 for comparison	9

Data

Raw data for Chironomus tentans emergence test

Statistical data for Chironomus tentans first emergence with control & reference sediment

Statistical data for Chironomus tentans emergence using reference station 8

Statistical data for Chironomus tentans emergence using reference station 9

Statistical data for Chironomus tentans total survival with control & reference sediment

Chain of Custody Documentation

MATTEO IRON AND METALS SEDIMENT TOXICITY TESTING – Chironomus tentans EMERGENCE

INTRODUCTION

During the month of August 2003, samples of sediment were collected from the Matteo Iron and Metals facility and surrounding area in Gloucester County, New Jersey. These sediment samples were used to perform toxicity tests to determine if the tested matrices represent a significant threat to potential receptor organisms.

The sediment samples from the study area were delivered to American Aquafic Testing, Inc. (AAT) and evaluated for toxicity using a 65-day solid phase exposure with the midge *Chironomus tentans* [1]. During the exposure period, test organisms that emerged from the juvenile stage into adults from the sediments collected at the site were compared to a control set tested under similar conditions using sediment of known environmental quality. The endpoints used for determination of an impact in the midge exposures were time to first emergence in days, total emergence and total survival.

MATERIALS AND METHODS / Chironomus tentans

Surface sediment samples were collected at stations adjacent to the Matteo Iron and Metals facility in Gloucester County, New Jersey. Station locations were selected to represent areas that may have been impacted by the facility's operations. Sediment samples were also taken at stations in the surrounding area for the purpose of making reference comparisons.

Preparation of sediment samples for testing

The sediment samples collected on August 18, 19 and 20 2003, were transported to the Severn Trent Laboratories facility in Edison, NJ and picked up by AAT personnel on August 21, 2003. Samples were collected in 2.5-gallon high-density polyethylene (HDPE) containers and transported on ice. Upon arrival at AAT on August 21, 2003, the samples were refrigerated until being used for testing on September 3, 2003. These samples were not altered other than to remove large debris and organic material (larger than ~3 cm) before testing.

Control sediment used to assess the health of the test organisms used for testing was collected from the Spruce Run Reservoir in Clinton, NJ on August 26, 2003 and was screened on-site using a #18 mesh screen to remove large debris and indigenous organisms. Screened sediment was placed in a five gallon HDPE container for transport to the laboratory and refrigerated until used for testing on September 3, 2003. Control sediment was analyzed for grain size, and total organic carbon (TOC) by Severn Trent Laboratories in Edison, NJ. The results of these analyses are included at the end of this appendix.

Test organisms

Egg cases of the study chironomid, *Chironomus tentans*, used to supply larval test organisms for the study were obtained from stock cultures maintained by Aquatic Biosystems, Inc. of Fort Collins, CO and were received in-house on September 3, 2003. Prior to testing, the organisms were held under conditions similar to that which they would encounter during the test (see Table I). The midges were not fed prior to test initiation. At the beginning of the 65-day exposure, the test organisms were <24 hours old.

A reference toxicant test using potassium chloride was conducted concurrently with the initiation of the 65-day exposure to assess the sensitivity of the lot of organisms used in the sediment test. The 48 hr LC_{50} produced was 2301.1 ppm. This test value falls within the range of the data set AAT is currently developing for this species. A copy of the raw data is included with the other raw data for this test in Appendix A.

Experimental procedures

The entire sediment exposure series for this project consisted of ten sediment samples from the study area and one of control sediment from Spruce Run Reservoir. Test chambers (300 mL tall form borosilicate glass beakers) were filled with 100 mL of sediment. 175 mL of test water was poured over the sediment gently to cause minimal disturbance. There were five replicate chambers for each station treatment. Test chambers were allowed to settle for 24 hours prior to test initiation.

After the settling period, the overlying water was siphoned off and fresh water was introduced, using a small, round HDPE disk suspended over the sediment to deflect the water flow and minimize disturbance to the sediment. Water quality data including alkalinity, ammonia, conductivity, dissolved oxygen, temperature, pH, and hardness were measured inifially on composite water samples from all samples, prior to the introduction of test organisms, and at the end of the exposure for each sample and the control. Conductivity was also measured at 7, 14, 21, 28, 35, 42, 49 days in all samples and the control. Final conductivities were recorded as individual sample exposures ended. The dissolved oxygen, pH and temperature were also measured initially and every 24 hours thereafter for the duration of the exposure for each sample and the control.

The exposure period began by placing 12 randomly selected test organisms into each chamber. Care was taken to ensure that the organisms were released beneath the surface of the overlying water to keep air bubbles from forcing the organisms to the surface. Test chambers were fed once a day during the exposure period with a slurry of dry fish flake food and deionized water to deliver approximately 4 mg/L to each chamber. Test conditions are summarized in Table I.

Observations were made and recorded for each chamber each day during the exposure period to assess organism health. Observations included the number of organisms dead, swimming, on the surface of the sediment or on the surface of the water. Dissolved oxygen, pH and temperature were measured and recorded each day from a new replicate chamber for each sample and the control. 150 mL of the overlying water was siphoned off twice a day and replaced using reconstituted water as a measure to maintain sufficient dissolved oxygen levels. Care was taken to minimize disturbance of the sediment during water renewal by using the small HDPE disc.

Beginning on day 20, all test beakers were tightly covered using fine mesh nylon window screen and rubber bands. These covers retained emergent adults in their respective chambers so they could be recorded twice per day. Those individuals that achieved complete emergence were recorded as adult flies to be used in the statistical analysis of this endpoint. Incomplete emergence, those individuals that successfully began to emerge for the pupae, but then became caught, or expired in the process, were recorded as such but not included in the statistical analysis. There were only two individuals that were recorded as incomplete emergents.

At the end of the exposure period, described below, the final alkalinity, ammonia, conductivity, hardness, dissolved oxygen, pH and temperature were measured, and the test chambers were prepared for the removal of test organisms. With the overlying water present in each chamber, the top 20% of sediment was gently stirred into suspension. The slurry was then poured into a #60 mesh screen (250 µm) and rinsed in a shallow pan of laboratory water to remove the finer grains of the sediment. Sediment remaining in the sieve was placed into a second shallow pan of water over a light table, and carefully sorted to find the surviving test organisms. Using additional laboratory water, this process was repeated two or three times for each replicate until all the sediment had been inspected. All surviving organisms were transferred to a 30 mL soufflé cup for live count verification.

On day 44 of the exposure, the controls reached a total emergence of 53.3% (32 of original 60 test individuals). As this was the final endpoint being assessed, the control treatment could be ended when it achieved >50% emergence of original test organisms. At this time, each test sample was then evaluated individually on a daily basis to determine when it should end. Once a station sample had not recorded a new emergent adult for seven consecutive days after the control treatment ended, that set of five replicate chambers was sieved and all remaining surviving test organisms were recorded.

Data analysis

Data analysis was performed following procedures published by the USEPA [1] using the Toxstat [2] data analysis software. Survival data, in the form of proportion of survivors in each chamber, was transformed by arcsine squareroot and then tested for normality using the Shapiro-Wilk's test or the Chi-Square test and for homogeneity of variance using Bartlett's test, as appropriate. Analysis of variance (ANOVA) followed by Dunnett's *a posteriori* pairwise comparisons or Steel's Many-One Rank test, as appropriate, to evaluate differences between stations and the control sample.

American Aquatic Testing, Inc.

TABLE I: Summary of Conditions for Chironomus tentans Toxicity Test

1.	Test type;	Whole sediment, static, daily renewal
2.	Temperature;	23.0 +/- 1.0 ° C
3.	Light quality;	Wide-spectrum fluorescent illumination
4.	Light intensity;	50 - 100 foot-candles
5.	Photoperiod;	16 hours light, 08 hours dark
6.	Test chamber size;	300 mL high form borosilicate glass beakers
7.	Sediment volume;	100 mL / replicate
8.	Overlying water volume;	175 mL / replicate
9.	Renewal;	2 volume exchanges per day
10.	Age of test organisms;	<24 hours
11.	Number organisms / container;	12
12.	Replicates;	5
13.	Feeding;	4.0 mg flake fish food / day
14.	Aeration;	None unless dissolved oxygen concentrations \leq 2.5 ppm
15.	Overlying water;	Laboratory reconstituted water
16.	Test chamber cleaning;	Only if necessary
17.	Overlying water quality;	D. O., pH and temperature daily; alkalinity, ammonia, conductivity, hardness & pH at beginning and end of test, conductivity @ 7-day intervals
18.	Test duration;	Approximately 50-65 days
19.	Effects measured;	Time to first emergence, total emergence and total survival
20.	Test acceptability;	Min. control survival 65 %, control emergence ≥50%

RESULTS

Effects on First Emergence / Control and Reference Samples

Raw data are presented at the end of this Appendix. The number of days each replicate took to produce the first adult was recorded as a percentage of the total time of the test exposure, 65 days. Data were arcsine square root transformed. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival of organisms in station sediments and the control sample.

Results from the analysis, which compared the time to first emergence in station sediments with that of stations 8 and 9, the two reference stations, are presented in Table II and at the end of this Appendix. The control values are included for comparative purposes.

Of all the stations in the study area, only station 3 was found to have a significantly greater number of days to first emergence. All remaining stations: 4, 5, 6, 7 and 10 did not produce values statistically different from either of the reference stations. Stations 1 and 2 are not included in this analysis as they were originally included as potential reference site but unacceptable survival negated their use as references.

Table II. Average time to 1st emergence of C. tentans by station using stations 8 & 9 for comparison

Station	Average Days to 1 st Emergence	% of 65 Day Exposure	Significant vs. station 8? ²	Significant vs. station 9? ²
Control ¹	29.2	44.9		-
8	31.4	48.3		N/A
9	30.8	47.4	N/A	-
3	51.2	78.8	YES	YES
4	41.6	64.0	No	No
5	40.8	62.8	No	No
6	36.6	56.3	No	No
7	33.6	51.7	No	No
10	31.2	51.1	No	No

^{1 -} Control included for comparison only

^{2 –} Reference sites not compared to each other

Effects on Total Emergence / Control and Reference Station 8

Raw data are presented at the end of this Appendix. Data were arcsine square root transformed. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between growth of organisms in station sediments and the control sample.

Results from the analysis, which compared the total emergence in all samples with that of station 8, a reference station, are presented in Table III and at the end of this Appendix. Emergence is evaluated at seven day intervals beginning with day 44, when the control treatment reached >50% emergence. The control value is included for comparative purposes.

Reference station 8 ended on day 61, with a total emergence of 66.8%. It should be noted here that at day 44, when the control treatment surpassed the 50% emergence level, station 8 had produced 48.4% emergent adults. However, the criterion for the ending any sample treatment was no emergent individuals for seven consecutive days, so station 8 continued until day 61. Compared with station 8, stations 6 and 7 at no time showed a significant difference in total emergence on any of the days used for evaluation (44, 51, 58 & 65). Of the four remaining stations; 3, 4, 5 and 10, all had significantly less emergence at day 44 compared to station 8. At 51 days, station 3 had ended, stations 4 and 5 were still statistically different compared to station 8, and station 10 had produced sufficient numbers of adults to not be significantly different at day 51. At 58 days, station 5 had ended, and stations 4 and 10 were different from station 8. At the end of the test, day 65, station 4 had ended and station 10 was again not statistically different from station 8. Stations 3, 4 and 5 have been highlighted in the table below to show that at all points during the exposure period these stations were producing significantly different responses compared to that of station 8. The last sample from station 10, appears to have suffered some deleterious response, however the statistical analysis at day 65 did not find the final emergence of 39.4% to be different from station 8.

Table III. Total emergence of C. tentans by station using station 8 for comparison

Statio	%	Significant	%	Significant	%	Significant	%	Significant
n	Emergence	vs station 8	Emergence	vs station 8	Emergence	vs station 8	Emergence	vs station 8
	@ 44 Days	@ 44D	@ 51 Days	@ 51D	@ 58 Days	@ 58D	@ 65 Days	@ 65D
Contro 1	53.4	-	-		-	-	· -	-
8	48.4	-	61.6	-	66.8	_	66.8	
3	3.2	YES	Ended	-	-	-	.	-
4	16.4	YES	19.8	YES	19.8	YES	Ended	-
5	16.6	YES	16.6	YES	Ended	-	<u>-</u>	-
6	35	No	48.2	No	70	No	76.8	No
7	28.2	No	41.6	No	46.6	No	46.6	No
10	24.8	YES	34.8	No	34.8	YES	39.8	No

Effects on Total Emergence / Control and Reference Station 9

Raw data are presented at the end of this Appendix. Data were arcsine square root transformed. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between growth of organisms in station sediments and the control sample.

Results from the analysis, which compared the total emergence in all samples with station 9, the second reference station, are presented in Table IV and at the end of this Appendix. Emergence is evaluated at seven day intervals beginning with day 44, when the control treatment reached >50% emergence. The control value is included for comparative purposes.

Reference station 9 ended on day 65, with a total emergence of 71.6%. It should be noted here that at day 44, when the control treatment surpassed the 50% emergence level, station 9 had produced 45.2% emergent adults. However, the criterion for the ending any sample treatment was no emergent individuals for seven consecutive days, so station 9 continued until day 65. Compared with station 9, stations 6 and 7 at no time showed a significant difference in total emergence on any of the days used for evaluation (44, 51, 58 & 65). Of the four remaining stations; 3, 4, and 5 had significantly less emergence at day 44 compared to station 9. Station 10 was not found to be different from reference station 9. At 51 days, station 3 had ended, stations 4 and 5 were still statistically different compared to station 9, and stations 6, 7 and 10 were not significantly different. At 58 days, station 5 had ended, and stations 4 and 10 were different from station 9. At the end of the test, day 65, station 4 had ended, stations 6 and 7 ended with no difference compared to station 9, and station 10 remained statistically different from station 9. Stations 3, 4 and 5 have been highlighted in the table below to show that at all points during the exposure period these samples were producing significantly different responses compared to that of station 9.

Table IV. Total emergence of C. tentans by station using station 9 for comparison

Statio	%	Significant	%	Significant	%	Significant	%	Significant
٠.	Emergence	vs station 9	Emergence	vs station 9	Emergence	vs station 9	Emergence	vs station 9
n	@ 44 Days	@ 44D	@ 51 Days	@ 51D	@ 58 Days	@ 58D	@ 65 Days	@ 65D
Contro 1	53.4	-	-	-	<u>-</u>	5. -	-	-
9	45.2	-	58.4	-	66.8		71.6	
3	3.2	YES	Ended	-	_	_	_	-
4	16.4	YES	19.8	YES	19.8	YES	Ended	-
5	16.6	YES	16.6	YES	Ended	-	-	-
6	35	No	48.2	No	70	No	76.8	No
7	28.2	No	41.6	No	46.6	No	46.6	No
10	24.8	No	34.8	No	34.8	YES	39.8	YES

Raw data are presented at the end of this Appendix. Data were arcsine square root transformed. The data were found to be normally distributed, were tested for homogeneity of variances using Bartlett's test, and found to be homogeneous. It was therefore determined that parametric analyses were appropriate, and ANOVA followed by Dunnett's pairwise comparisons were used to determine differences between survival of organisms in all station sediments and the control sample.

Results from the analysis, which compared the total survival in all samples with that of stations 8 and 9, the two reference stations, are presented in Table V and at the end of this Appendix. The control values are included for comparative purposes. The remaining stations; 1, 2 and 10 were considered as alternate reference stations but unacceptable survival negated their use as references. The recommended minimum survival for the emergence portion of this test is 65% at the completion of testing. The control treatment as well as reference stations 8 and 9 exceeded this level of surviving test organisms.

Of the stations in the study area, station 3 was found to have a significantly lower survival than stations 8 and 9. Of the remaining stations, 4 and 7 were found to have statistically different survival rates when compared to station 9.

Table V. Total survival of C. tentans by sample location using sites 8 & 9 for comparison

Station	Total Survival %	References Significant vs Control?	Significant vs station 8? ²	Significant vs station 9? ²
Control	88.3	-	-	_
1	25.0	YES	-	-
2	40.0	YES	. -	_
3	50.0	-	YES	YES
4	21.7	-	No	YES
5	81.7	-	No	No
6	81.7	-	No	No
7	46.7	-	No	YES
8	68.3	No	_	N/A ²
9	80.0	No	N/A ²	-
10	55.0	YES	No ³	No ³

^{1 -} Control included for comparison only

REFERENCES

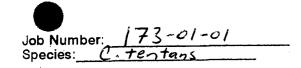
[1] Ingersoll, C.G., G.A. Burton, T.D. Dawson, F.W. Dwyer, D.S. Ireland, R.A. Hoke, N.E. Kemble, D.R. Mount, T.J. Norberg-King, P.K. Sibley, and L. Stahl 2000 Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates EPA 600/R-99/064. U.S. Environmental Protection, Office of Science and Development, Duluth, MN

[2] Toxstat March, 1994 Version 3.4 data analysis software published by West, Inc. Western EcoSystems Technology, Inc., Cheyenne, WY

^{2 -} Reference stations not compared to each other

^{3 -} Site 10 included as site sample due to possible contamination effects

RAW DATA FOR *Chironomus tentans*EMERGENCE TEST





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Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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JITE	C	Ĭ	स्रवायाय	W COLON	CT CT	8	B	B	B	В	8	B	В	B	R
2	D	3	R	B	B	B	R	B	B	. В	B	B	В	B	<u>~</u>
~	E	13	罗	B	В	В	<u>3</u>	В	B	В	<u> </u>	B	<u>8</u>	B	8
	A	1	7	В	ব্	B	В	B	3	B	3	В	B	B	8
Site	В	8	7	B	В	B	B	B	B	В	\ <u>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</u>	В	B	B	B
	C	B	Ŕ	В	B	B	В	B	В	В	N	В	B	B	B
3	D	13	ß	В	3	B	8 8	B	8	В	<u>B</u>	· B	8_	<u>B</u>	8
	E	\$	8	B	3	13	B	\mathcal{B}	3	B		8	B	B	<u>B</u>
		75	ß	B	3	B	B B	В	B	B B	3	B .	8_	8	8
Site	A B	B	R	B	В			Ř	B	В	B B	B	8	<u> </u>	8
	С	B	B	7B	В	B	В	В	B	В		В	3	B	8
7	D	Š	3	B	B	B	ß	В	Ř	В	B	В	B	\$	B
	E	B	В	B	B.	B	B	B	B	В	ろ	B	8_	B	ß
Initia	ls	25	95	JF	8/1	TE	790	7000	mp	790	N	7000 91,2	Do	25	70°
Date		9/3	9/4	9/5	09/06	9/7	9/8	9/9	9/10	9/11	9/12	• / /	9/14	9/15	9/16
	Key: D=dead, N=normal activity, A=abnormal activity, B=No Observations												ervation	าร	

Comments:

7460

Job Number: 173-01-01 Species: C. tentans Hatch

Beginning Date & Time: 9-3-03 1841 Ending Date & Time: 11-07-03 12-00

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

	. (D	ay						
Conc.	Rep.	0	1	2	3	4	5	6	7	8	9	10	11	12	13
	Α	7	3	В	3	B	B	B	B	B	B	B	<u>A</u>	8	B
	В	*	17	B	3	B	B	<u>B</u>	B	ß	B	B	B	<u>B</u> :	B.
Site	С	18	B	В	3	B	B	8	B	8	<u> </u>	B	B	B	R
	D	\$	B	B	В	13	B B	B	8	B	B	B	8	B	<i>B</i>
5	Ε	\$	ত্ত	B	В	B		B_	3	<u></u>		В	B	β	
	Α	R	B	6	В	B	B	B	B	В	8	B	B	B	8
Site	В	8	В	3	В	В	B	B	B	B		B	B	B	R
J	C	B	8	B	B	13	B	B	B	В	B	В	8	333	B
6	D	B	B	В	3	B	3	B	B	В	В	В	R	<u>B</u>	0
	E	Ī	B	B	3_	BB	B	В	B	В	3	8	B	B	B
	Α	B	B		В	B	R	B	B	В	8	·B	B	B	N
Site	В	B	Ü	B 3	3	B	B	B	B	В	B	B	μ	B	B
אונ	С	B	B	B	3	CLEMBICA CLE	B	B	B	B	B	B	В	3	LB
7	D	R	B	B	3	В	B	В	B	В	В	B	B	B	<u>B</u>
′	E	B	B	৪	В	B	B	В		B	3	В	B	B	В
	Α	B	B	В	-3	B	B	B	8	В	B	B	B	B	8
Site	В	B	R	B	3	B	В	B	当	B	B	B	B	<u>B</u>	B
	С	B	B	R	B	B	<i>1</i> 3	В	B	В	B	B	В	В	8
8	D	7	8	B	В	B	B	B	B	В	B	B	8	BB	B
,	Ε	7	B	B	<u>2</u> 3	В	ß	B	B	B	B	В	B		7
	Α	K	8	B	3	000	- B	В	B	В	3	B	B	<u>B</u>	B
Site	В	13	B		3 3		B	B	B	В.	333	N	B	B	B
	C	R	8	B	3	B	B	B	B	B	2	B	B	<u>B</u>	3
9	D	₹.	B	D B B	B	B	<u> 3</u>	B	3	<u>පු</u> ප්	3	N	В	<u>s</u> _	B
	E	B	B	B		B	8	B	B		B	В	B	В	B
Initia	ls	and	952	JE	9/1	JC_	1000	7000	ng	700	mp	780	TOR	NO	96/16
Date	9	9/3	9/4	वैंड	ogldo dead	417	9/3	9/9	_ প[ত abnorm		9/12	9/13	9/14 ervation	9 15	<u>U16</u>

Key: D=dead, N=normal activity, A=abnormal activity, B=No Observations

Comments:

THEO

Job Number: 173-01-01

Species: C. tentans



Beginning Date & Time: 9-3-03 189 Ending Date & Time: 11-07-03 1200

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

	. (,		D	ay						,
Conc.	Rep.	0	1	2	3	4	5	6	7	8	9	10	11	12	13
00110.	Α	3	K	8 8	5	B	B	B	B	B	В	B	B	5	<u>B</u>
	В	*	B	B	3	В	B	B	B	В	B	B	B	B	B
Site	С	R	B	B	3	B	B	B	B	B	8	B	B	B	8
10	D	R	B	B	B	<u>B</u>	BB	B	8	B	8	B	8	8	B
10	Е	R	3	B	B	B	B	හ	B	В	10	В	8	10	
	Α													 	
\	В														
\	С							·							
	D						<u> </u>				ļ			 	
,	Е				ļ <u>.</u>						-	<u> </u>	1		
	Α												<u> </u>	<u> </u>	
\	В				ļ								·		
	С			· · · · · ·	ļ		<u> </u>			<u> </u>	 	 		<u> </u>	
	D									ļ	 			 	
	Ε		· ·		 							L	 		
	Α		ļi												
	В										 	<u> </u>			
\	C							•						· · · · · · · · · · · · · · · · · · ·	
. \	D		· .		 										
	٤	2520			+	=======================================									
	A B			<u> </u>											
	C														
	D														
	Ε										<u> </u>			<u> </u>	
Initia	ls i	dist	6/4	JF	9/	TR	TOPP		2	1617	2	1000	TOP	me	7000
Date	9	9/3		9/5	0966	9/7	9/8	9/9	9/10	9/11	19/12	9/13	2/14		9/12

	Ney. D double, it is a series of the series
Comments:	

Job Number: 173-01-01
Species: C. tentans



Beginning Date & Time: 9-3-3 1849 Ending Date & Time: 11-07-03 12-00

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

							Obs	ervation	s/Live C	ount						Day	y 28
	: '								ay					<u> </u>			y 28 Final
				40	17	18	19	20	21	.22	23	24	25	26	27	Observ	
Conc.	Rep.	14	15	16		8	B	B	B	B	В	В	B	B	В	B	
•	A	B	B	B	8		B	B	B	B	B	8	B	BB	B	B	
<u> </u>	В	B	B	B	B	<u>B</u>	<u>B</u>	B	ß	8	B	8	8	R	B	25	a
Control	С	\mathcal{B}_{-}	B	B	B	<u>B</u>		B		B	Ř	B	3	B	B	B	
C0111.01	D	B	B	B	B	<u>6</u>	B	8	B	B	B	B	B	В	3	B	
	E	ß	B			B	B		<u> </u>		B		Ø	β	B	B	
	Α	B	B	8	B	B	В	<u>B</u>	B	B	3	B	3	B	8	B	
Site	В	B	B	B	8	6	<u>B</u>	<u>B</u> .		B		 	B	B	8	B	
3.,,=	С	7	B	B	В	B	B	<u>B</u>	β		R	B	8		2	B	
1_	D	B	B	B	ß	B	В	8	B	8	8	B	B	B	32	B	ϕ
	E	B	β	B	B	Ø	B	B	B	B		B	2	В	B	B	
	Α	ß	B	B	ß	6	Ŋ	B	B		B	8	8	8	B	2	
Site	В	В	B	B	В	B	B	3_		B	B		<u>B</u>	D	B	B	
2116	c	පි	B	B	B	B	B	β	B	13	B	B	-8- -	B	B		
2	D	R	В	B	B	B	ß	η.	B	16	B	В	- B -	B		B	Ø
	E	8	B	В	B	ß	B	<u></u>	B	B	B	B	3	\mathcal{B}	B		<u> </u>
	Ā	B	В	В	В	B	R	B	B	13	B	B	g	B	B	B	
5:40	В	B	В	B	В	(5)	B	B	B	B	B	B	B	B	8	В	
Site 30	C		B	В	В	B	B	6	B	13	В	<u>B</u>	B	B	B	B	
ろの	D	B B	B	B	B	B	8	B	8	B	3	B	B	13	B		<u> </u>
ン	E	B	B B	3	3	B	8	8	β	В	13		В.	B	<u> 1</u> 5	IP	
, 	Ā	<u> </u>	B	R	N	B	B	B	ß	B	B	B	<u> </u>	B	B	B	
· C · 10	B	B	a	6	B	1		B	В	B	B	9	B CCC		B	B	L
Site	C	B	B	B	B	8	B	В	β	B	B	100 CD	<u> </u>	B B	B	<u> </u>	
് പ്ര	-		B	B	B	8	В	в	B	8	В	8	<u>B</u>	8	ß	ß	
. 7	D E	B	8	8	B	(S)	B	B	B	B	B	B	(PR)	β	B	В	0/
·				190	700	16	top	TAD	708	NOP	W6	me	9/28	100	WO:	7000	2/
Initia		790	7000	21.0	6/2.	9/21	9/22	9/23	9/24	925	928	927			930	10/1	du
Date	e	9/17	4/18	1119	- doad	N=nori	mal acti	vity, A=	abnori	nal acti	vity B=	no obse	ervation	is $P =$	Pupae	F: Fly	
			1	rey. D-	– acau,			- ,			-						

Comments:	1 1 201 1 1 14.28 DO Chilles
$\overline{\mathbb{Q}}$	OLIGOCHAETES PRESENT (3) TOTAL EMERCENT ADULTS AT END OF 14 DAY EXP- 14-28 DAYS GITHIGS
	39,30 8/20/03/08
(3)	OLGOCHARIES PRESENT
	40,46

28

Job Number: 173-01-01 Species: <u>C. tentans</u>



Beginning Date & Time: 9-3-03 1840 Ending Date & Time: 11-07-03 12-50

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

							Obs	ervation	s/Live C	ount				,		Day	/ 28
	ŗ							D	ay		 			· · · · · · · · · · · · · · · · · · ·			Einal -
	Rep.	14	15	16	17	18	19	20	21	22	23	24	25	26	27	Observ	Count
Conc.	A A	8	B	B	В	B	B	B	B	₽	\$	8	5	В	B_	5	
Site	B	B	<u>B</u>	\vec{B}	B	8	В	B		В	B	18	B_	B	B	8	
Site 5	c	B	B	Ř	3	8	В	B	R	B	B	B	6	\mathcal{B}_{-}	B	B	
ζ^{\odot}	D	B	8	B	B		B	B	B	B	В	B	3	B	1 B_	B	
<u> </u>	E	\mathcal{B}	B	B	B	00	в	B	B	B	B	B	B	В	LB_	8	\$
	A	ਲ	В	B	В	8	ß	B	B	В	В	B	5	_B	<u> </u>	В	
<i>C</i> .	B		B	B	3.		В	B	B	B	B	B	B	<u>B</u>	B.	B	
Site	C	B	B		B	8	B	B	В	B	B	B	B	В	<u>B</u>	В	
Site	D	B	B	B	B	(b)	B	B	B	B	B	B	B	B	B	3	
0	E	8	<u> </u>	B	B	(P)	5	В	В	8	B	B	B	В	13	B	Ф
	A	R	B	B	В	0	B	B	B	B .	B	B	B	B	B	B	
C	B	B	B	B	B	8	B	В	B B	B	R	B	B	В	B	B	
Site	C	3	B	B	B	N	В	B	\mathcal{B}	B	B	B	B	B	B	B	
7	D	B	B		B	6	R	B	в	Ď	B	13	B	В	B	B	
Ť	E	Ã	B	B	В	<i>⊕</i>	B	B	в	B	B	B	13	B.	B	B	Ø
	A	B	B		R	6	B	R	В	В	B	B	B	B	B	6	
Site	B	3	B	B	B	8	B	B	В.	10	B	13	B	B	<u>B</u>	B	
3176	C	B	B	B	B	G	R	B	2	В	B	B	8	B	B_	B	
8	D	B	В	Q	B	(3)	B	O	B	B	B	B	B	β	B	B	
0	E	Ĥ.	B	B	B.	ъ	β	\sim	B	B	B	B	B	β	<u> </u>	IF	
	Ā	B	B	B	В	(3)	B	ß	B	B	В	1-B	<u> B</u>	В	B	13	
Site	В	B	В	B	B	B	B	В	β	3_	B	3	B	B	3	TF.	
	C	B	B	B	β	6	Ğ	B	В	B	B	B	18	14	TA	B	
9	D	B	B	B	В	8_	B	В	<u>B</u>	B	B	3	<u>B</u>	B	B	B	
,	E	B	B	В	В	0	B	B	\mathcal{B}	B		B	13	В	B	B	
Initia		B100	DR	1000	700	76	7000	7730	TAD	me	Mg	US	No	700	me	TRIP	X
Date		9/17	9/12	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	5/28	9/29	930	E = Fly	11/11
		/- /-		Kev: D:	= dead	N=nori	nal'acti	vity, A=	abnorn	nal activ	vity B=	no obs	ervation	is $F = F$	upae	F= 1-17	

Comments:		0 = 0 = 0 = 0 × 0 × 0 × 0	11 2500 10 CA 1/5
DZ OLCOCHAETES	50.60.5E 08/00/03	3) TOTAL EMERGENT ADULTS AT END OF 14 DAY EXP	19-28 DNYS / 1/11/03
2 PRESENT	GRIGO CA		
			

THEU

Job Number: 173-01-01
Species: 6. tentans



Beginning Date & Time: 9-3-03 /840 Ending Date & Time: 11-07-03 12-00

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

		-					Obs	ervation	ns/Live C	ount					-	Day	y 28
	_							D	ay							↓	Final
	0	4.4	15	16	1 17	18	19	20_	21	22	23	24	25	26	27	Observ	Count
Conc.	Rep.	14			B	В	B	B	B	B	В	8	13	B	18	B	· · · · · · · · · · · · · · · · · · ·
C.,	Α	B	B	B_		8	R	B	R	3	B	8	16	B	B	В	
Site	В	B		6_	B	8	B	B	8	B	B	0	В	B	B	В	
4 ·-	С	B	8	<u> </u>	В		B	0	8	B	B	13	8	B	B	B	
10	D	В	В	B	B	\ <u>\</u>		B	B	3	B	6	3	В	B	B	Ø
	E	Ř	<u>B</u>	<u> </u>	B	B	B	 _	<u> </u>		 			 	 		
	Α					<u> </u>					 	-	-	 	 		
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	C														<u> </u>	ļ	
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	E		Ļ			 		77.4		18	me	0.0	IND	790	Me	TOG	0/
Initia	ls	700	7000	7090	700	76	TOP	TOP	9/24	9/25		9127		9/29	950	10/1	nhi
Date		9/17	9/18	9/19	= dead,	1921	9/22	9/33	17/24		70-	17/2/	1/1-0	1710)			

Comments: ① TOTAL EMELGENT ADVITS AT END OF 14 DAY EXP. 14-28 DAYS S/11/11/63	TARU

Job Number: 173-01-01 Species: Q. tentens

Beginning Date & Time: 9-3-03 /84
Ending Date & Time: 1/-07-03 /8-6

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

						<u></u>		<u>_</u>	av] (4)
				31	32	33	34	35	35_	37	38	39	40_	41,	42	
Conc.	Rep.	29	30	15	7/2	 }	₹ '	F	3	B	B	B	8	IF	B]7
	Α_	IF	JE.	IF	IF	7	ZF	<i>P</i>	3	8	B	B	8	IF	13	6
Control	В		TF	18	16	IP	3	В	3	B	B	B	B	B	13	4
	С	IF TO	<u>B</u>		7	 	1F	8	2F	B	B	13	B	IF	B]5
	D	P	<u></u>	B	<u>B</u>	1-2	8	TĔ	B	TE	15	B	11=	B	B	5/2
	Ε	100	<u> </u>	18		R	18	<u>B</u>	IF	18	B	13	В	K	B	Z
	Α	В	3	TRIP			3	<u> D</u>	3	B	F	B	3	R	3	2
Site	В	B	3	117	В	3	R	90	B	IF	15	B	B	B	15	3
	С	B	3	B	B	3		<u> </u>		-3	B	B	B	7	12	7
1	D	В	3	B	B	B	B		3	B	B	2	Ř	Ŕ	B	6/2
	Е	ß	3	B	B	B		B			TF	13	2	 	6	5
	Α	В	B	R	В	(3)	B	IF_	3	IF.	1-1-	13	3-	3	B	7
Site	В	\mathcal{B}	B	ß	B	B	B	B	B			13	2		12	12
אוכ	C	$\frac{B}{B}$	B	B	B	B	B	B	3	B	B			B	4	タ
2	D	B	B	В	В	(3)	3	B	B	\$	B	13	B	10=	3	3/12
	E	B	8	е	B	B	3	JF_	3		B			<u> </u>		3/12
	A	B	B	B	B	15	3	_B:	15_	B	B	B	B	R	ig_	- ',
Site	В	$\frac{\mathcal{S}}{\mathcal{B}}$	3	ß	B	B	B	<u> </u>	B	B	B	B	3-	B	13-	P
_	C	$\frac{\mathcal{B}}{R}$	8	ß	B	IJ	B	B	R	B	13	3	3	K	13-	. ♥
3	D	B	R	ß	8	3	B	B	B	LB_	\mathcal{B}	13	B	8	12	Ø
.	E	g	2	B	B	B	8	B	13	13	B		13	1F	8	1/2
		B	8	R	В	3	3	В	B	3	11-	15	<u> </u>	8	13	72
Site	A B	B	3.	B	B	3	1-	B	B	B	13	B	B	B		√′.
	C	B	P.	R	B	B	2	B	13	B	<u>B</u> _	15	<u>B</u>	B	B	12
4	D	B	R.	B	B	B.	8	13	13	B	B	1.13	3	B	B	P 12 12
'	E	B	3.	B	Ø	3.	8	B	<u> </u>	2F	IF	15	3	R	В	3/1
- in: - i				TONO.	100	MD.	945	J6`	VVQ	WP	JE	JE,	me	and.	R	3
Initial		10/2	750/3		1.7	1	10/7	80	1019	10/10	10/11	10/12	10/13	10/14	10/15	Julu
Date		10/1	79/1	ov: D-	- dead	N=norn	nal activ	ity, A=	abnorn	nal activ	/ity, B=	No Obs	ervàtio	ns /=/	my dance	F-F/7

Comments: OB @ 2 large widentified floor energed?	ALL DENTIFIED AS CHORENS
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	1-(00/2).3-50
(4) TOTAL EMERGENT ADJUTS AT END OF 14 DAY PERCOD	29-42 DAYS 1/4/03 2/
(4) TOTAL EMERGENT HOULTS AT END OF 14 DAY TOURD	0

Hatch

Job Number: 173-01-01 Species: C. tentars Beginning Date & Time: 9-3~3 1840 Ending Date & Time: 11-07-03 1800

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

									Day	<u> </u>			······································			$\exists (4)$
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Site	В	TF	R	B	3	18	IF	13	14	R	IF	B	IF	185	2	3
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Comments: Dedead, Nenormal activity, A=abnormal activity, B=No Observations == F/G

Comments: Description of the server of the s

-TARL

Hatch

Job Number: 173-6 Species: C. tentans Beginning Date & Time: 9
Ending Date & Time: 11

me: 9-3-03 184

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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OTOTAL EMERGENT ADJUTE AT END OF 14 DAY PERIOD 29-42 DAYS STUMBS

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Hat

Job Number: 173-01-01 Species: C. tentans Beginning Date & Time: 9-3-03 /34 Ending Date & Time: 11-07-03 12-00

Freshwater Sediment Test American Aquatic Testing, inc.,

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Date	2	1016	10/17	13/8	- dood	N-nor	mal activ	vity A=	abnorm	nal activ	/itv. B=	No Obs	servatio	ns F=	Fly	P= pu	pac
		n -		ey: D:		/ 344	Distra	· · · y , · · · ·			3 , =			•		, ,	

Comments: (1) Found unidentified nymph. 1MD 10/160

QUARTERS RULE EMERGENT ADULT EDECASE.

(3) CONTROLS ENDED Q 44 DAYS: 50% HATCH OF ORIGINAL GOTEST ORGANISMS 10/16/1038/

FINAL BURNY ATE (ALL INCL) 83:3%

(4) SITE 3 ENDED: 7 DAYS AFTER CON. - NO ADD'LEMERGENCE 5% HATCH. FINAL BURY (ALL INCL) 20/1,7% 10/21/038/

(5) SITE 4 ENDED: 10 DAYS AFTER CON. - NO ADD'LEMERGENCE 20 YOHATCH FINAL BURY (ALL INCL) 21,7% 10/21/038/

(TSTAL EMERGENT ADULTS AT DAY 58 (CONTROL + 70) + DAY SLO 11/163

TARU 56 Job Number: 173-41-01
Species: C.tentans

Beginning Date & Time: 9-3-63 / 34 Per Ending Date & Time: 12-03 13-00

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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Comments: U3 M/P 10/16

(2) UNBUCCESSFUL EMERGENT ADJUT 10/86 G/

(3) SITE 5 ENDED! 7 DAYS HETER CON - NO ADD'L EMERGENCE. 16.7% HATCH FINAL SURV (ALLINCL) 81.7% POLBY/03 G/

(4) TOTAL EMERGENT ADJUTS AT DAY 51 (CONTROL + 7D) + DAY 56 11/41/03

THRU 56 Job Number: 173-01-01 Species: 2-tentans Beginning Date & Time: 9-3--3 184 Ending Date & Time: 11-07-03 P.00

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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			*						Day					 		$\neg (2)$
Conc.	Re	p. 43	44	45	46	147	48	49	50	57	52	53	54	155.	56	<u>- 51,56</u>
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Comments:

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() TOTAL EMERGENT ADULTS AT DAY 51 (CONTROL + 70) + DAY 66 11/11/03

56 56 Job Number: 173-01-01
Species: C tentans

Beginning Date & Time: 9-3-03 1840 Ending Date & Time: 11-07-03 i2-00

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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Site	В	3	B	IF	B	B	8	B	15		Count					ø	7.
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Date		10/30	1931	1101	11/0		11/7	11(3)	11/10		- D			L	أكرنيا		<u>-</u>

Key: D=dead, N=normal activity, A=abnormal activity, B=No Observations F= F/y P= pupge
Comments:

OSITE | ENDED CIS DAYS A GTER CON. NO ADDIL EMERGENCE. 25% HATCH. FINAL SURY (ALL INCL.) 25% 1161/23 & OBSITE 2 ENDED CIP DAYS AFTER CON: NO ADDIL EMERGENCE. 38.3% HATCH. FINAL SURV (ALLINCL.) 40% 1164/63 & OBSITE 8 ENDED CIP DAYS AFTER CON. NO ADDIL EMERGENCE 65% HATCH FINAL SURV (ALLINCL.) 68.3% WOSIS & OBSITE 6 ENDED CIP DAYS A MERCHA. CON. + 21 DAYS REACHED 75% HATCH FINAL SURV (ALLINCL.) 81.7% 1164/63 & OBSITE 7 ENDED CON DAYS AFTER CON. + 21 DAYS REACHED 46.7% HATCH FINAL SURV (ALLINCL.) 81.7% 1164/63

TARU

Job Number:	173-01-01
Species: C	tentans

Beginning Date & Time: 9-3-03 /846 Ending Date & Time: 11-07-08 /200

Freshwater Sediment Test American Aquatic Testing, Inc., Observations/Live Count

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	<u>c</u>	Final	Count	11/18			-		 		 		,] ;
9	D	Final	Count	14,		-	-]
	E	final	Count	=1	 	+			T] .
	A	,	 		 	 	 				1.]
	В		 	 		-] .
	D	<u> </u>	· · · · · · · · · · · · · · · · · · ·		 	 										
	E		 			<u> </u>	1			·						
	A		 	<u> </u>						,						
	В	-														1
	C			-												-
<u> </u>	D		-											4.*		
	Ε								<u> </u>	 					 	
	A	. •					<u> </u>		ļ ·		ļ		,			- 3
	В					<u> </u>	ļ			<u> </u>				*.		1
	С		1					· · · · · · · · · · · · · · · · · · ·			-		`			1
1	D		,		<u> </u>			ļ		· · · · · · · · · · · · · · · · · · ·					·	1
	E					185	9	20-	7	THE				<u></u>		1
Initia		957	H	149	JE	902	3)	10/	11/	11/2						1
Date	e	10/30	10/31	11	11/3	11/5	rnal acti	1///	/6-	W/		In Ohn	tior	o FE E	N= 00	د د د جمام

Comments:

(1) SITE 10 ENDED 1@ 13 DAYS AFTER CON. - NO HOD'L EMERGENCE. 28:3% HATCH FINAL SURY EALL INCL 46.7% INSO 63 GA
(2) SITE 9 ENDED @ 21 DAYS AFTER CON. CON + 21 DAYS REACHED. 70.% HATCH

Job Num	ber: 173-01-01
Species:	Citentans



Start Date & Time: 9-3-End Date & Time: 11-9-3

Sediment Test American Aquatic Testing, Inc., Water Change Log/Initial Water Readings/General Testing Information

Test Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Morning change(time)	09 30	550	(020)	0930	0900	0920	0910	0800	0745	0830	0700	1000	0730	0800	0745
D.O. mg/L	7.6	7.5	8.0	7.7	8.5	7.2	8.4	8.4	8.7	8.4	8.4	8.2	8.2	8.6	8.5
рН	7.4	8.0	7.9	7.9	8.3	7-8	8.2	8.2	8.2	8.4	8.1	8.0	8.1	8,1	8,2
Temp. (C)	24.0	24.0	24.0	23.0	22.5	23.0	22.0	22.5	22.5	23.0	23.0	37.5	27.5	22.0	22.5
Initials	MP	m	m	9/	or	2	790	JC	38	TF	708	7000	T	OF.	<i>3</i> 6
Date	93	9 4	195	0966	04/07	5/8	9/9	4/10	9/11	9/12	9/13	9/14	915	916	वींग
Afternoon change(time)	1725	1730	1700	1850	1638	1630	1610	1610	1610	1700	1730	1730	1800	1710	1800
D.O. mg/L	7.6	7.6	8,3	8,2	517	7.9	8.4	8.2	8.2	8.5	8.2	81	8.1	8,0	3.4
рН	7.6	7.9	7.6	8.3	8.3	7.8	7.6	7.6	7.6	8.1	7.9	7.9	7.9	7.9	8.0
Temp. (C)	23.5	22.5	27.0	220	220	23.0	22.0	22.5	22.5	22.5		23.5	22,0	23.5	23.0
Initials 🚕	90	7000	76	Jî		92 P	350	30	my	TF	7000	70%	70	AV	700
Date	9/3	9/4	9/5	9/6	9/7	1/8	979	9/10	9/11	9/12	9/13	9/14	9/15-		9/17
															
Test Day	15	16	17	18	19	20	21 .	22	23	24	25	26	27	28	
Morning change(time)	0730	6900	0900	0900	0745	0930	1030	6800	0830	030	1000	1000	0800	0500	
D.O. mg/L	8.2	8.6	8.3	8.4		8.0	8.0	88	8.8	8.8	8.8	8.4	8.3	8.0	
рН	8.2	8.2	B-/	8.2	8,0	7.9	2.4	7.6	7.6	7.6	·3€.7	7.4	81	7.9	
Temp. (C)	72.5	220	20.5	22.0	22.5	2210	22.0	220			22.0	220	220	22.0	
Initials	万	J. Tr	9	TF	₽F	9/	9/	36	X	MS	MD	we	J6	we	
Date	9/18	9119	09/20	9/21	9/22	69/23	09/34	9125	9/26	9/27	b 28	929	9130	1611	
Afternoon change(time)	1700	1500	1230	1930	700	2200	1630	1730	1800	2000	الهجم	1.730	1800	1946	
D.O. mg/L	8.2	8.9	8.2	8.1	7.9	7.9	7.7	8.3	8.7		5.3	8.5	7.8	8.1	
рН	7.8	7.7	7.9	7.8	80	7.9	7.7	7.9	7.7	7.9	7.7	7.6	78	8.0	
Temp. (C)	23.0	22.0	23.0		220	22.0	24.0			220	72.0	22.0	220	240	
Initials	25	10 m	76	3/			900	me	NA	30	N	NP	708	JA	
Date	9718	9719	9/6	2/2/	9/22		9/24	925	9/24	9127		9/29	9/30	101	
							*				1		-1/-/-		
			1 -	_											

Control Sed. collection date/by: $8-26-03/95$	Organism source: <u>ABS The</u> Test organism Lot number: 640	Test Chamber size: 300 m / Test Volume of sediment: 100 m /
Sieve size used:	Number of animals per chamber: 12	Test Volume of water: 175ml
Sample sieve date/by:	Food Type: Tetramin slurry	Test Duration: 65 DAVB
Sieve size used: ν/A	Frequency of feeding: 1x a day	Test Temperature Range: 23だパン



Start Date & Time: 9-3-03 End Date & Time: 1/-07-05

Sediment Test

American Aquatic Testing, Inc.,

Water Change Log/Initial Water Readings/General Testing Information

				3.5	7.3	30	36	W.	27	38	39	41.0	41	42	43
Test Day	29	30	3/	33	945	10730	1000	1000	0930	1100	0845	0950	J838	0930	1010
Morning change(time)	0730	1000	900	800			6.4	8.5	8,4	8.6	7.9	8/3	8.1	7.9	8.0
D.O. mg/L	7.9	8.0	7.9	8.1	8,5	7.8	3.1	8.0	8.0	8.1	79	7.4	8.2	8.0	79
рН	8.5	8.5	8.2	8.0	13.8	22.5	72-0	23.0	23-0	22.0	770	22'5	22.5	220	22.5
Temp. (C)	320	25.0	32.5	225	122.5 IN	JF	200	0	JA	3	TE	mo	7000	TOP	100
Initials	56	144	708	700	 '\\		10/8	1009	10/10	16/11	10/12	10/12	14/14	10/15	12/16
Date	19/2	10/3	10/4	10/5	110/0	1017		1720	1740	1800	1/100	1650	1815	1740	1700
Afternoon change(time)	1750	1700	1800	1500	1725	1650	1300	-	8.5	825	7.9	183	7.9	8.2	हा
D.O. mg/L	77	8.8	8.2	8.3	18.3	3.7	8,6	3.5	8.0	80	79	85	79	8.0	8.0
рН	8.6	7.8	8.1	8.0	1 -	1. t	800	7.9	23.0	230	22.0		220	220	22-0
Temp. (C)	225	320	22.5	22.5	22.0	22.0		12.0	VVP	36	TF	NA C	TAG	704	up
Initials	TOP	7090	704-	700	90	AD.	JE			10/11	10/12	10/13	10/14	10/15	1016
Date	10/2	16/3	10/4	10/5	10/6	10/7	108	1014	10/10	10/11	1910	110113		1 7/ 3	1,011,00
		•							-4:	F-2	-11	55	56	57	٠ ،
Test Day	44	45	46	47	48	49	چې	51.	52	<u>53_</u>	-5-7-			1000	
	0800	0930	1030	1100	1015	1030	1000	0930	630	1045	1030	1000	0930		+
D.O. mg/L	Q.0	7.8	7.5	8.1	6,5	7.2	8,1	8,0	7.9	7.8	7.9	7.8	8.0	3.7	4
pH	79	7.8	8,1	8.1	811	8.0	7.7	22.0	8.0	8:1	8.0	7.9		22.0	-
Temp. (C)	720	22.0	22. O	21.5	24.0	22.0	22.0		22.0	<u> </u>	23.5	23.0	700	in	
Initials	TE	9	My	CC	my	me	mo	JC	1	121	700	me	00/29	 '\	'
Date	10/17	12/18	10/19	10/20	10/21	10/22		10/24	10/05	iofale	10/27	10/52		10/30	1
Afternoon change(time)	1700	1930	1730	1650	1700	1830	1650	1630		1400	1700	1700	1700	1620	ļ
D.O. mg/L	80	7.8	9.3	8,0	7.1	7.1	7.9	46	7.9	7,9	7.7	7.8	チュ		.
pH	29	8.1	8.3	7.9	CY TO		3.0	70	7.9	80	7.8	8-0	8.3	8.0	{
Temp. (C)	22.0	24.5	22.0	22.0	24.0	22.0	220	22.0	22.0	23.0	23.0	23.0	23.0	23.0	
Initials	11	3/	952	AL	92	me	ino	2	18/_	A	TR	WP.	950	20	{
Date	10/17	10/18	10/14	10/20	10/21	10/55	10/23	10/24	10/28	10/0/0	10/07	10/28	10/29	10/3c]
	<u> </u>	<u></u>	- ~	, /-				•					_		
	. (D 8.1	- 9KJ	10/2	1						T4 Ot-	سيسيس.			
					O						בו דפם ו	amber s	178:		

Control Sed_collection date/by:	Organism source:	Test Chamber size:
Control Sed. sieve date/by:	Test organism Lot number:	Test Volume of sediment:
Sieve size used:	Number of animals per chamber:	Test Volume of water:
Sample sieve date/by:	Food Type:	Test Duration:
	Frequency of feeding:	Test Temperature Range:



	·	
Job Number:	173-01-01	
Species:	? tentans	

Start Date & Time:_ End Date & Time:_

Sediment Test

American Aquatic Testing, Inc.,
Water Change Log/Initial Water Readings/General Testing Information

			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		3,										
Test Dav	398	59	60	161	6.7	63	64	65			 	 			
Morning change(time)	0945	1040	1700	01.30			0930				ļ	ļ			
D.O. mg/L	XI	7.0	X, O_	8,0	8.2	8,2	8.2		ļ	<u> </u>	 				
pH	7,6	7.7	17.5	1.6	8.0		8.0			ļ		ļ	ļ		
Temp. (C)	7.2.0	23.5	225	22.0	123.0	22.5	23.0	<u> </u>			1	 	ļ		
initials	St	THE	56	12	7	77-	102		<u> </u>	ļ		 	ļ		
Date	16/31		11/2	11/3	11/4	11/5	11/6			<u> </u>	<u> </u>	 			
Afternoon change(time)	1030	1750	1600	1550	1630	1610	1710		<u> </u>		ļ	ļ	 		
D.O. mg/L	13.	45 ° ()	10 D	8.1	8.3	18.1	18,0				 	<u> </u>			
Hq	7.6	7.6	7.5	8,0	8.0	8.1	7.9		· ·	 	ļ <u> </u>				
Temp. (C)	22.0	22.0	27.0	23.0	24.0	23.0	21.	} 	 	ļ		<u> </u>			
Initials	K	No	176	A 237	12		1		ļ	ļ	 	 	 		
Date	10/31	111	11/2	11/3	11/4	11/5	11/6	<u> </u>	<u> </u>	1		1	<u> </u>		
			· /				·		,	,					1
Test Day	j.,										 	1 2 %			
Morning change(time)											 	 	ļ		
D.O. mg/L				·				·				 			
РН			·	<u> </u>		<u> </u>			<u> </u>	ļ	 	 			
Temp. (C)						 			·	 	 	 			
initials			<u> </u>	<u> </u>		<u> </u>		L	 	 	 	ļ	 		•
Date			<u>L</u>		<u> </u>	<u> </u>			<u> </u>	<u> </u>		 			
Afternoon change(time)	·			<u> </u>					ļ	ļ		 			
D.O. mg/L			<u> </u>			 			<u> </u>			 	 		
рН					 	 				 		 			
Temp. (C)		<u> </u>		ļ	 		<u> </u>				 	 			:
initials			<u> </u>	ļ	ļ	 	 	<u></u>	ļ	 	 	 			
Date		<u></u>	<u></u>	1	<u> </u>	<u> </u>			ļ <u> </u>	حسوط					
										7					•
		•			Organia	sm sourc					Test Ch	amber s	ize:		
Control Sed. collection of	date/by:_				Organis	siii sourc	·e·				1,001,011				
					Toot or	raniem i	ot numb	or.	-		Test Vo	lume of	sediment	:	
Control Sed. sieve date/	by:				lest or	ganism L	.ot name	· · ·							
					Klimbo	r of anim	ale nor d	hamber	••		Test.Vo	tafine of	vater:		
Sieve size used:					HUITIDE	-VI allill	- A	, IQI1ID GI	·		Test Votafine of water:				
					Food T	vne:		><			Test Duration:				
Sample sieve date/by:				<u>.</u>	1,000,1)60.										
er termedi					Frequency of feeding:					_	Test Temperature Range:				
Sieve size used:			· ·			-									
													_		

Hatch

Client/Toxicant: 173

Job Number: 01-01

Species: C-tentans

Beginning Date & Time: 9-3-3 1846 Ending Date & Time: //-07-03 /200

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

							Day					
Parameter	Concentration	0	1	2	3	4	5	6	7.	8	9	10
	Control	23.0	22.5	220	22.0	22.0	22,5	22.5	22.0	22.5	22.0	22.0
	Site 1	23.c	32.5	22.0	77.0	22.0	22.5	22.5	22.0	22.5	22.0	22.0
Т	Sitez	23.0	22-0	22.0	22.0	220	22.0	22.5	33.0	22,0	22.0	31.0
E	Site3	23.0	32.0	220	22.0	220	22.0	22.5	22.0	22,0	22.0	22.0
М	Site4	23.0	37:0	720	22.0	22.0	22.C	22.0	32.0	22.0	22 O	2), 0
Р	Sites	23.0	27.5	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
	Site 6	23.0	JJ.0	220	22.0	22.0	22.0	22.0	22.0	22,0	22.0	220
(C)	Site7	23.0	J.J. 3	22.0	220	220	22.0	23.0	22.0	22.0	22.0	32.0
	Site8	23.0	33.3	220	22.0	220	22.0	22.0	38.6	22.0	22.0	22.0
	Site9	230	32. C	220	22.0	22.0	22.0	320	22.0	22.0	22.0	22.0
	Site 10	23.0	3. C.	27.0	22.0	220	22,0	22.0	22.0	22.0	J	22-0
	Control	6.3	6.6	7.0	4.7	7.4	6.1	7.4	6.6	6,3	7.3	6.7
	Site1	6.9	6.8	7.4	7.1	7.7	6.60	7.3	7.1	7.1	7.3	7.0
	Sitea	6.9	6.9	7.5	7.2	1.5	6.7	7.5	7.0	6.8	7.5	71
Dissolved	Site 3	4.4	6.1	2.3	6.4	6.7	5.8	6.2	6.4	5.5	6.0	5.9
Öxygen	Site 4	5.0	6.3	(6.8	69	7.3	6:5	7.0	6.6	6.4	17.3	70
	Sites	5.3	6.3	(2.8	616	7.3	6.5	6.9	4	6.3	7.3	7.0
(mg/L)	Site 6	5.8	6.5	6.8	(0.7	7.3	6.4	6.9	6.8	16.5	7-3	7.0
	Site 7	3.2	6.6	7.0	4.8	7,2	6.5	6.9	6. t	6.8	7.3	70
	Site8	2.5	6.6	613	10.9	17.1	6,4	7.0	6.8	6-3	7.3	7.0
	Site9	5.0	6.5	0.8	16.8	1 7.1	6.4	6.9	10.7	6.2	7.3	6.9
\	Site		6.6	7.0	10.6		6.3	7.2	16.1	6.5	17.2	6.9
7	Control	1,2	7.2	17.7	77	7.7	1.6	7.8	111	76	8,0	7.8
	Site 1	7.2	14.3	7.8	1 4 4	7.8	7.6	1./	17.7	1 1	80	7.9
	Site2	7.2	7.2	7.8	7.7	1/18	7.6	120	176	16	7.8	7.8
	Sites	7,2	14.3	7.7	16/	1-1-	14.5	110	135	1.5	7.8	7.7
ρH	Site 5	7.0	17.2	17.7	7.0	1 1 -	14.3	14.5	17.5 17.5	14.5	78	7.8
P	Site6	7,2	143	7.8	7,6	5	173	1-12	135	1 = 2	13.8	7.8
	5,407	177	7.4	7.8	7.6		17:3	17.5	7.6	7.6	7.9	7.7
	Site 8	7.2	7.4	7.8	7.0			7.6	7.6	7/	8.F	7.8
	Site 9	7,2	7.4	7.7	7.	1	7.6	76	7.6	7.6		7.8
	Site		7.4	7.7	- 77	7.8	7.5	7.5	J. f	7.6		7.8
	Initials	NI	95	- m	JF	JF	93	MY	me	957	MO	1090
	Date	9/3	19/4	195	19/6	19/7	9/8	19/9	1/10	9/11	912	9/13

_		Cond. (umbos)	Alkalinity	/ (mg/L)	Hardnes	s (mg/L)	Ammbni	a (mg/L)	Comments: ODay 7
	Concentration	Initial	Fina O	InitisI	Final	Initial	Final	Initial	Final	2-6.6-92-9/8
	Control	275	275	63	60	80	70	0.04	0,06	3-7.6-32-918
	Site 1	275	275	70	70	70	80	0.00	0.00	
	Sitel	275	275	70	70	80	90	0.00	0.00	
	Site 3	275	३२०	60	60	80	90	0.10	0.01	
	Sitey	275	275	60	70	80	90	0.00	0.03	
	Sites	280	380	70_	60	70	804	0.13	0.00	
	Site 6	270	270	60	70	70	80	0.13	0.00	
. [Site 7	280	270	70	70	80	90	0.16	0.0 i	
	Site 8	280	270	70	70	80	90	0.15	0.01	
	Site9	250	270	70	70	80'	90	0.23	0.01	
	Site 10	270	380	50	40	80	70	0.09	0.00	
	Initials	913	MO.	950-	7080	95.3	TOPO	92	TAP	
, [Date	1973	910	4/3	11/7	1/3	11/7	9/3	11/7	<u> </u>

FWSEDPAR.wk3

Hatch

Client/Toxicant:	173
Job Number:	01-01
Species: 2	tentan

Beginning Date & Time: 9-3-03 1840 Ending Oate & Time: 11-07-03 1800

Freshwater Sediment Test American Aquatic Testling, Inc., Physical / Chemical Parameters

								Day					
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Parameter	Concentration	11	12	1.3	14	15		17	18.	19	20	21
T $S_1 \neq 0$ $J_3 = 0$ $J_2 = 0$ $J_3 = 0$ $J_$		Control		Z	225	22.0	29.5	22.5	230	22.5		22.5	
E		Site 1	23:0	20.0	22.5	2200	22.5	22.5	د . 32		33.0	225	
M Sitey 33.0 20.0 22.5 32.0 20.5 22.5 33.0 20.0 23.0 22.0 23.0 P Sites 33.0 20.0 22.5 32.0 22.5 22.5 33.0 20.0 33.0 22.0 23.0 23.0 Sites 33.0 20.0 22.5 32.0 23.0 23.0 22.0 23.0 22.0 23.0 Sites 33.0 22.5 22.0 23.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 22.0 23.0 23	τ [Site 2	23.0	ઝ ∙O	225	20.0	92.2	22.5	33.0	22.0	23-0	22.0	23.0
P	E	Site3	23.0	220	22.5	220	22.5	22.5	23.0	22.0	23-0	22.0	3.0
(c) Site6 33.0 2.0 22.5 33.0 30.5 22.0 23.0 22.5 33.0 22.0 33.0 5.4e7 23.0 22.0 22.5 33.0 30.0 30.5 22.0 33.0 22.0 33.0 22.0 33.0 22.0 33.0 5.4e8 33.0 30.0 22.5 33.0 30.5 22.0 33.0 22.0 33.0 22.0 33.0 5.4e9 33.0 30.0 22.5 33.0 30.5 22.0 33.0 12.0 33.0 22.0 33.0 5.4e9 33.0 30.0 22.5 33.0 30.5 22.0 33.0 12.0 33.0 22.0 33.0 5.4e9 33.0 20.0 22.5 33.0 30.5 22.0 33.0 12.0 33.0 22.0 33.0 5.4e9 33.0 20.0 22.5 33.0 30.5 22.0 33.0 12.0 33.0 22.0 33.0 5.4e9 33.0 20.0 22.5 33.0 30.5 22.0 33.0 12.0 33.0 22.0 33.0 5.4e9 33.0 20.0 22.5 33.0 30.5 22.0 33.0 12.0 33.0 22.0 33.0 5.4e9 33.0 20.0 22.5 33.0 30.0 12.0 33.0 12.0 33.0 22.0 33.0 5.4e9 33.0 20.0 22.5 33.0 22.0 33.0 12.0 23.0 22.0 33.0 5.4e9 3.1 6.8 6.5 6.7 6.8 6.9 7.1 7.0 5.3 6.5 6.0 6.8 5.4e 3 5.8 5.6 5.5 5.6 5.6 5.7 5.8 5.7 5.2 4.0 4.0 4.3 4.7 5.3 5.4e 6 7.0 6.0 6.0 6.8 6.8 6.7 6.9 40.0 5.5 5.5 5.9 5.0 5.1 5.6 5.9 5.1 5.6 5.9 5.1 5.0 5.8 5.2 4.0 4.8 5.7 5.0 5.8 5.6 6.0 6.9 6.8 6.8 6.2 6.5 5.0 5.3 5.8 5.8 5.8 5.8 5.8 5.8 5.8 5.8 5.8 5.8	М	Sitey	23.0	20.0	22.5	220	22.5	22.5	23.01	22.0	23.0	22,0	33.0
(c) $\frac{5i+67}{5i+68}$ $\frac{23.6}{33.0}$ $\frac{22.0}{22.5}$ $\frac{23.0}{31.0}$ $\frac{32.0}{32.0}$ $\frac{22.5}{32.0}$ $\frac{32.0}{33.0}$ $\frac{32.0}{32.0}$ $\frac{22.5}{32.0}$ $\frac{32.0}{33.0}$ $\frac{32.0}{32.0}$ $\frac{32.0}{32.0}$ $\frac{32.0}{33.0}$ $\frac{32.0}{32.0}$ $\frac{32.0}{32.0}$ $\frac{32.0}{33.0}$ $\frac{32.0}{32.0}$ 32.0	P	Sites	23.0	35.0	22.5	220	23.5	22.5	23.0	22.0	23.0	22.0	23.0.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$]	Site6	23.0	22.0	22.5	27.0	32.5	22,0	23.0	22.5	23,0		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(C)	Site 7	23.0	22.0	22.5	220	22.5	22.0	23:0	22.0	23.0	22.0	33.2
Control 6.8 (2.8 6.5 6.7 6.8 6.8 6.9 6.0 6.3 6.8 6.5 6.7 6.8 6.9 6.0 6.3 6.8 6.5 6.7 6.8 6.9 6.0 6.3 6.8 6.5 6.7 6.8 6.9 6.9 6.0 6.3 6.8 6.5 6.7 6.8 6.9 6.9 6.0 6.3 6.8 6.8 6.5 6.7 6.8 6.9 6.9 6.0 6.3 6.8 6.1 6.5 6.7 6.8 6.9 6.9 6.0 6.3 6.8 6.1 6.5 6.7 6.8 6.9 6.9 6.0 6.9 6.9 6.9 6.9 6.9 6.9 6.9 6.9 6.9 6.9		Site 8		22.0	22.5	220	22.5	22.0	23.0	100.	23-0	22.0	33.6
Control 6.8 6.8 6.5 6.7 6.8 6.5 6.8 5.9 6.0 6.3 6.8 Site 1 7.3 9.1 6.8 6.9 7.2 7.0 10.3 6.4 6.1 6.5 Site 2 7.2 7.0 7.0 7.0 7.2 7.0 7.1 7.0 5.3 6.5 6.0 6.4 Oissolved Site 3 5.8 5.6 5.1 5.6 5.9 5.1 5.2 4.0 4.3 4.7 5.3 Oxygen Site 4 7.2 10.18 6.5 6.9 6.9 6.9 4.0 4.3 4.7 5.3 5.4 6.7 6.0 6.8 6.5 6.9 6.0 6.8 6.7 6.9 4.0 5.5 5.5 5.5 5.0 6.9 6.0 6.8 6.7 6.9 4.0 5.5 5.5 5.5 5.5 5.0 5.1 5.2 4.0 4.8 5.9 6.0 6.8 6.8 6.9 6.9 4.0 5.5 5.5 5.5 5.0 5.1 5.2 4.0 4.8 5.9 6.0 6.9 5.1 6.9 6.0 6.8 6.8 6.2 6.5 5.0 5.8 5.9 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.9 5.1 6.0 6.0 6.9 6.0 6.0 6.9 6.0 6.9 6.0 6.9 6.0 6.9 6.0 6.9 6.0 6.0 6.8 6.0 6.9 6.9 6.0 6.9 6.0 6.9 6.0 6.9 6.0 6.9 6.0 6.0 6.8 6.0 6.9 6.0 6.9 6.9 6.0 6.0 6.8 6.0 6.9 6.0 6.9 6.0 6.9 6.0 6.0 6.0 6.8 6.0 6.0 6.9 6.0 6.0 6.9 6.0 6.0 6.8 6.0 6.0 6.0 6.8 6.0 6.9 6.0 6.9 6.0 6.9 6.0 6.0 6.8 6.0 6.0 6.0 6.8 6.0 6.9 6.0 6.0 6.9 6.0 6.0 6.8 6.0 6.0 6.0 6.8 6.0 6.9 6.0 6.9 6.9 6.0 6.0 6.0 6.0 6.0 6.0 6.8 6.0 6.0 6.0 6.8 6.0 6.0 6.9 6.0 6.0 6.0 6.8 6.0 6.0 6.0 6.0 6.8 6.0 6.0 6.0 6.8 6.0 6.9 6.0 6.0 6.0 6.8 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0		Site 9	23.0	220	22.5	1220	22.5		23.0	22.0	23.0		
Dissolved Site 1 7-3 3-1 6.8 6.9 6.9 7.2 7.0 10.3 6.4 6.1 6.5 6.5 6.7 6.9 7.2 7.0 7.0 7.2 7.0 7.1 7.0 5.3 6.5 6.0 6.4 6.1 6.5 6.7 6.7 6.7 7.1 7.0 6.3 6.5 6.0 6.4 6.1 6.5 6.7 7.7 $7.$	· .	Siteto	23.0		22,5	199-0	193.2	22.0	123.0	1 44-	73.3		33.2
Dissolved $S.ite2$ 7.2 1.0 7.0 7.2 7.0 7.1 7.0 5.3 6.5 6.0 6.4 9.0 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.7 9.3 9.3 9.7 9.3		Control			6.5				6.8				
Dissolved $Site3$ $S.8$ $S.6$ $S.1$ $S.6$ $S.9$ $S.1$ $S.2$ 4.0 9.3 4.7 $S.3$ $0xygen$ $Site4$ 7.2 6.8 6.5 6.9 6.8 6.9 6.9 9.0 5.5 5.5 5.9 6.9 5.16 $5.$		Site1	7.3	17.1					7.0			6.1	
Oxygen $Site 4$ 7.2 6.8 6.5 6.9 6.8 6.9 6.9 9.9 9.0 5.5 5.5 5.9		Sitea							70			6,0	
(mg/L) $\begin{array}{cccccccccccccccccccccccccccccccccccc$	Dissolved							3.1				4.7	
(mg/L) $Si + e & 7 & 6 & 6 & 6 & 6 & 8 & 6 & 8 & 5 & 6 & 5 & 9 & 8 & 9 & 9 & 9 & 6 & 9 & 9$	Oxygen	Site 4				100	1.6	6.7					
Site 7 70 6.4 6.2 6.6 6.8 6.2 6.5 S.6 5.3 5.8 5.8 5.1 6.8 6.9 6.9 6.1 6.5 6.7 6.1 6.4 6.1 4.5 5.4 5.9 5.4 5.9 5.4 6.9 7.0 6.8 6.6 6.7 6.8 6.9 5.4 4.9 5.9 6.2 5.4 6.9 7.0 6.8 6.6 6.7 6.9 7.3 7.0 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.2 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.4 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.1 5.9 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.1 5.9 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.2 6.1 5.9 6.2 6.2 6.2 6.2 6.2 6.2 6.2 6.2 6.2 6.2				5.8	 -						171		
Site 8 6.9 6.5 6.1 6.5 6.7 6.1 6.4 6.1 4.5 5.4 5.9 5.4 5.9 5.4 6.9 7.0 6.7 6.0 6.5 6.7 6.8 6.9 5.4 4.9 5.9 6.2 5.4 6.9 7.0 6.8 6.6 6.7 6.9 7.3 7.0 6.4 6.1 5.9 6.1 6.1 6.9 6.1 6.9 6.1 5.9 6.1 6.9 6.1 6.9 6.1 5.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 5.9 6.1 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.9 6.1 6.1 6.9 6.1 6.1 6.9 6.1 6.1 6.1 6.1 6.1 6.1 6.1 6.1 6.1 6.1	(mg/L)	Site 6		- 	 -								
Site 9 7.0 6.7 6.0 6.5 6.7 6.8 6.9 5.4 4.9 5.9 6.2 5ite 10 7.0 6.8 6.6 6.7 6.9 7.3 7.0 6.4 6.1 5.9 6.4 6.1 5.4 6.1 6.1 6.1 6.1 6.1 6.1 6.1 6.1 6.1 6.1	1) \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		
Site 10 7.0 6.8 6.6 6.7 6.9 7.3 7.0 6.4 6.1 5.9 6.4 Control 7.9 4.5 7.5 7.6 7.7 7.7 7.8 7.7 7.6 7.6 7.8 Site 1 7.9 7.5 7.5 7.6 7.8 7.7 7.8 7.7 7.5 7.6 7.8 Site 2 7.8 1.5 7.5 7.6 7.8 7.7 7.8 7.7 7.5 7.6 7.8 Site 3 7.7 1.5 7.3 7.4 7.5 7.7 7.8 7.0 7.4 7.6 7.5 Site 4 7.8 1.5 7.3 7.4 7.5 7.7 7.7 7.8 7.0 7.4 7.6 7.6 Site 5 7.8 1.4 7.3 7.6 7.7 7.6 7.8 7.6 7.7 7.5 7.3 7.5 7.6 Site 6 7.8 1.4 7.3 7.6 7.8 7.6 7.7 7.5 7.3 7.5 7.6 Site 7 7.8 1.6 7.5 7.7 7.8 7.9 7.8 7.0 7.5 7.4 7.6 Site 8 7.8 1.6 7.5 7.7 7.8 7.9 7.8 7.0 7.5 7.4 7.6 Site 9 7.8 1.5 7.5 7.7 7.8 7.9 7.8 7.0 7.5 7.4 7.6 Site 10 7.8 7.5 7.5 7.7 7.8 7.8 7.8 7.0 7.5 7.4 7.6 Initials 7.0 No 9.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.5 7.4 7.6 Initials 7.0 No 9.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7							~ 1 7 1				4.0		
Control 7.9 1.5 7.5 7.6 7.7 7.7 7.8 1.1 7.6 7.6 7.8 5.76 1.7 1.5 1					·	16,5							
Site 1 79 7.5 7.5 7.6 7.8 7.7 7.8 7.7 7.5 7.6 7.8 Site 2 78 1.5 7.5 7.6 7.8 7.7 7.8 7.7 7.5 7.6 7.5 Site 3 7.7 7.5 7.3 7.4 7.5 7.7 7.8 7.7 7.4 7.6 7.5 Site 4 7.8 1.5 7.3 7.5 7.7 7.7 7.7 7.7 7.0 7.4 7.6 7.6 Site 5 7.8 1.4 7.3 7.6 7.7 7.6 7.8 7.5 7.3 7.5 7.5 7.6 Site 6 7.8 1.4 7.3 7.6 7.8 7.6 7.7 7.5 7.3 7.5 7.6 Site 7 7.8 1.6 7.5 7.7 7.8 7.9 7.8 7.9 7.7 7.7 7.4 7.6 Site 8 7.8 1.6 7.5 7.7 7.8 7.9 7.8 7.0 7.5 7.4 7.6 Site 9 7.8 1.5 7.5 7.7 7.8 7.8 7.8 7.8 7.8 7.9 7.5 7.4 7.6 Site 10 7.8 7.5 7.5 7.7 7.8 7.8 7.8 7.8 7.8 7.9 7.5 7.4 7.6 Initials 780 NO 702 700 700 702 702	/					- 6							
Site 3 78 15 7.5 76 78 7.7 78 77 7.8 77 7.6 7.5 7.6 7.5 Site 3 7.7 7.5 7.3 7.4 7.5 7.7 7.7 7.7 7.8 7.0 7.4 7.6 7.5 5ite 9 7.8 7.4 7.3 7.6 7.7 7.8 7.6 7.8 7.5 7.3 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9							·	77					
Site 3 7.7 7.5 7.3 74 7.5 7.7 7.8 7.6 7.6 7.6 7.6 5.4 64 7.8 7.5 7.3 7.5 7.7 7.7 7.8 7.6 7.6 7.6 7.6 7.6 7.6 7.6 7.8 7.7 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.5 7.5 7.6 5.4 66 7.8 7.4 7.3 7.6 7.8 7.6 7.7 7.8 7.9 7.8 7.9 7.5 7.4 7.7 5.4 8 7.8 7.6 7.8 7.7 7.8 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9						_ + ' '		13.5					
Site 4 78 7.5 7.3 7.5 7.7 7.7 7.8 7.6 7.6 7.6 7.6 7.6 5.4e6 7.8 7.4 7.6 7.6 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.8 7.6 7.7 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.8 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9 7.9	1	5 10 3	 					77			- 7	7 2.7	
pH 5.165 78 74 73 76 77 7.6 78 7.5 7.5 7.5 7.5 7.6 7.7 7.6 7.7 7.7 7.7 7.7 7.7 7.7 7.8 7.9 7.9 <td>1</td> <td>5,100</td> <td></td> <td></td> <td></td> <td></td> <td><u></u></td> <td>145</td> <td></td> <td>107</td> <td></td> <td>1 76</td> <td>12/</td>	1	5,100					<u></u>	145		107		1 76	12/
Site 6 7-8 7-4 7-3 7-6 7-8 7-6 7-7 7-5 7-3 7-5 7-6 7-7 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-8 7-9 7-9 7-9 7-9 7-9 7-9 7-9 7-9 7-9 7-9	pH	Sites		1						7.5	7.9	775	7.6
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Site				7.0	5 7·x		,	7 7.	5 7.3	7.5	7.6
Site 8 7-8 16 7.5 7.7 7.8 7.9 7.8 7.9 7.8 7.4 7.6 Site 9 7-8 1.5 7.5 7.7 7.8 7.8 7.8 7.8 7.5 7.4 7.6 Site 10 7-8 7.5 7.5 7.7 7.8 7.8 7.8 7.6 7.5 7.4 7.6 Initials 780 NO 90 70 70 70 70 70 70 70 90 90 70 70 70 70 70 70 70 70 70 70 70 70 70		Site	7 78	17(7.9	77	1,5	0 73	5 7.4	1 7.7
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		Site				7.	7 7.8	7,9	73	7.1		5 7.4	1 7.6
Initials 780 100 900 700 100 100 100 100 100 100 100 100 1								7.8	7.2	ار کار	0 7,5	7.9	
Date 9/14 9 15 9/16 9/17 9/18 9/19 9/20 9/21 9/22 9/23 9/20									7 1 7.7	3 171	0 7.5		
					- 1 A 777	147					1 - 1	- 1,,5	2 000
		Date	19/1	41911	5 17/1.	5 9/1	7 9/11	7 19/19	2 19/2	17/2	419/		319/2

		Cond. (imhos)	Alkalinity	(mg/L)	Hardnes	s (mg/L)	Ammonia	a (mg/L)	Comments: Day 14
į	Concentration	Inittal (Einal	Initih	Final	Initial	Final	Initial	Final	@Day 21
1	Control	270	275							
	Site1	775	260							·
	Site 2	275	270					·		
[Site 3	270	220				,			•
[Site 4	270	280							
	Sites	270	280				1			
	Site6	270.	270							
	Site 7	275	285							
. [Site8	280	290			1				
	Site9	275	230			,				
	Site 10	275	380							
	Initiais	7000	me							
FWSEDPAR.wk)	Date	9/17	9/*/	<u> </u>		<u> </u>				·

Client/Toxicant:	173	
Job Number	01-01	
Spacios:	testant	

Beginning Date & Time: 9-3--3 /840 Ending Date & Time: //-07-03 /200

Freshwater Sediment Test American Aquatic Testing, inc., Physical / Chemical Parameters

	Í						Day					7
Parameter	Concentration	aa	23	24	25	26	27	28	29	3.0	31	3.2
	Control	22.0	22.0	20	22-0	230	8.0	22.5	23.0	22,0	225	225
	Site1	33.0	22.0	20	22.0	23-0	3.0	22.5	23.0	220	22.5	225
τ .	Site 2	22.0	27.0	22.0	220	23.0	23.0	22.5	23.0	2210	:22.5	22.5
E	Site 3	82-0	22.0	22.0	220	23.0	23.0	22.5	23.5	220	22.5	22.5
М	Site4	22.0	22.0	32.0	72-0.	23.0	23:0	225	23.0	220	27.5	27.5
Ρ	Sites	220	220	22-0	22-0	23.0	33.0	225	23.0	22.0	21.5	22.5
	Site 6	220	22.0	22.0	220	23.0	23.0	22.5	23:0	1220	122.5	22.5
(C)	Site 7	220	22.0	20	22-0	23.0	23.0	225	23.0	122.0	137.5	22.5
	Site 8	22-0	22.0	22:0	220	23.0	33.0	225	23.0	2216	37.5	332
1	Site 9	22.0	22.0	22.0	22.0	23.0	23.0	22.9	23.0	122.0	20.5	23.5
	Site10	22.0	22.0	220	1220	23.0	28.0	122.5	73. 0	12214	2) 23.5	177.5
	Control	6.0	5.5	6.1	6.6	6.2	14.9	4.2	5.3	5.7	5.6	5.3
	Site 1	6.0	5.7	6.0	60	6.1	5.0	4.5	2.8	6.4	6.9	6,0
1	Site 2	5.7	4,2	50	5.1	5.2	4.8	5.7	60	6.8	6.9	5.9
Dissolved	Site 3	5.0	4.8	55	57	5.9	4.3	4.0	5.5	5.1	5.0	
Oxygen	Sitey	5.7	15.4	15.6	15.7	60	4.7	4.1	15 Y	5.6		50
	Sites	5.8	4.0	4.8	4.9	5.4		4.3	4.9	15.2	5.0	4.9
(mg/L)	Site6	5.6	4.1	4.8	4.7	5.0		4.0	4.8	15.8	5.1	4.8
	Site 7	5.5	15.7	5.3	5.0	15.5	4,8	4.0	4.8	2,3		4.9
	Sited		43	4.6	14.7	4.8		4.1	15.	1 5	7 <u>5.</u> 5	51
	Site		5.3	56	5.2	5.0	4.5	4.1	5.1	15.	$\frac{5}{1}$	23
<i>'</i>	Sitel		15.6			5.5	5.0	4.9		- 6	1 6.0	15.7
	Control	18.0	7.8	7.9	8.0	7.0		7.		7.6		7 78
1	Site:		7.7	17.7	7.9	80		7.		5 70		7 78
	Site	7 7.7	7.6	17.7	153		7.5	le:		7.6		4 7.6
	Site	4 7.6		138		150	7 75	lei	7 7 1	7.	3 7.9	
рH	Site	< 7.6		7-6	7.7			19	1 7.4			7 78
	Site	67.6		7-60		7.		7.	2 76		7	
	Site	7 7-6			7-8				27		7 7.	
	Site	37.6	7.5	7.5	7.7		8 7.4		1 7.6	7	7 7	
	Site	9 7.6	7.5	7.5.	7.6	7.	5 3.4		1 7.0	J.		
	Site				17.0	, 7,	7 + 4	77,	1 7.		7 1 7	8 77
•	Initials		70	MP	W	104	, in	J.	The			
	Date	19/2	5 9 2	19/2/	- 14/2	<u>8 9/2</u>	9 9 30	0 110	1 10/	10/	3 10/	1 10/5

	Cond. (umhos)	Wkalinit	y (mg/L)	Hardnes	s (mg/L)	Ammoni	a (mg/L)	Comments: ODay 35
Concentration	Initial ('Finel(3)	Initiat	Final	Initial	Final	Initial	Final	(2) Diy 42
Control	270	280					·		
Site1	265	270							
Sitea	260	270							
Site 3	270	280							·
Site 4	265	275							
Sites	260	275							
Site 6	260	270			,	<u> </u>			,
Site 7	260	270							
Site8	760	230	1	:					
Site9	260	275			. '			·	
Site 10	1.265	270	<u> </u>						
Initials	TOP	TOOS						1	
WSEDPAR.WES Date	10/8	19/15	<u> </u>	<u> L. </u>	<u> </u>		<u> </u>		

Client/Toxicant:_	173
Job Number:	01-01
Species: C-	tentans.

Beginning Date & Time: 9-3-03 1840 Ending Date & Time: 1/-07-03 12-00

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

							Day					
Parameter	Concentration	33	34	3.5	36	3.7	38	39	40	41	42	43
	Control	22.0	24.0	31.0	235	23.0	22.0	22.0	32.5	32.5	22.0	22.5
	Site 1	220	40	24.0	230	23.0	220	22.0	22.5	22.5	22.0	22.5
Т	Site2	22.0	t, o	24.0	230	230	220	220	22.5	22.5	22.0	22.5
E	. Site 3	21.0	24.0	24.0	23.0	230	22.0	220	22.5	22.5	27.0	22.5
M	Sitc4	23.6	24.0	24.0	230	23.0	22.0	220	27.5	27.5	22.0	22.5
P	Sites	J). o	21.0	24.0	23.0	23.0	22.0	220	22.5	22.5	27.0	22.5
	Site 6	22.0.	0.15	24.0	23.0	23.0	220	22.0	22.5	22.5	22.0	22.5
(C)	Site 7	22.0	24.0	240	23.0	23-0	220	220	22.5	23.5	22.0	23.5
	Site 8	22.0	24.0	24.0	23.0	23.0	220	22.0	97.2	27.2	32.0	22.5
	Site 9	22-0	24.0	24.0	23.2	23.0	220	220	29.5	29.5	29.0	22.5
	Site 10	29.0	24.0	Jt.0	23.6	23.0	220	220	22.5	33.5	33.0	22.5
1	Control	5.9	5.2	5.3	4.4	4.8	6.0	4.60	59	5.4	5.8	4.1
	Site 1	5.7	6-1	62	6.6	6.5	6.5	5,2	5.9	5.5	5.9	6.0
	Site 2	5.7	5.10	5.5	6.3	6.4	6.8	4.5	5.6	5.3	5.7	5.9
Dissolved	5:1e 3	4.7	4.2	4.4	4.0	4.2	58	2.1	5.8	4.6	4.8	5.1
Oxygen	Site 4	5.3	4.5	4.7	4.8	4.5	10.4	5,0	5.7	5.9	6.1	6.3
	Sites	5.6	4.0	4.0	4.4	4,4	151	4.0	5.9	5.8	6.0	6.0
(mg/L)	Site 6	5.8	4.0	4.1	4.3	4.4	5.4	4.6	5.7	15.6	15.8	6.0
	Site 7	5-8	9.1	53	4.8	49	5.6	31/2	2.8	15.3	5.4	
	Site 8	5.8	4.7	4.8	4.9	<u> </u>	6.0	5.4	5.4	51	5.4	5.6
	Sitelo	5.7	-	 	5.7	5.5	S.7		2.6	5.3	5.7	
	- -		60	60	74	7.5	67	3.6	57	5.5	1 7 8	5.8
	Site I	7.8	15	75	74	75	7.8	7.6	3.0	7.8	7.0	7.8
	Sitel	7.7	133	7.6	7.4	7.5	~~~	7.60	8.0	77	77	78
	Site 3	7.6	7.5	7.6	174	7.5	1	71	7.8		12.4	75
	Site4	7.7	7.5	7.6	7.4		7-	7.6	7.9	7.7	7.6	7.7
ρH	5.125	7.7	7.4	7.6	7.5	7.4	7.6	7.5	7,9	127	2.7	7.3
'	. 5: te 6	77	7.4	75	7.5		7.6		8.0	7.7	7.7	
	Site 7	7.8	7,4	75	7.5	7.4	7.6		8.0	7.7	7.8	77
	Site 8	7.8	7.4	7.5	7.5	7.4	7.6	7.5	3.0	7.7	7.8	7.8
	Site 9	7.8	7.4	7.5	7.5	7.4	3.0	7.5	8.0	77	7.8	7.8
<u> </u>	5:te 10		7.9	7.5	7.6	1-4	7.5	17.4	7.9	7.6	7.7	7.8
	Initials	1000	we	INC.	Inf,	mp	J6	136	TOP	TOP?	700/0	TOP
	Date	10/6	1017	10/8	10/01	1010	110/11	10/12	10/1	3 10/14	10/19	W/16

			CAU E S	- (-: - 0 \):		-, -,			Do NO
r		umhos)	Alkalinih	y (mg/L)	Hardnes	s (mg/L)	Ammoni	a (mg/L)	Comments: @ Day 49 caless
Concentration	Initial	Final	Inithat	Final	Initial	Final	Initial	Final	other is marked with
Control	F275								F for final Condecenvity @ Day 56
Site 1	280	270							@ Day 56
Site 2	270	275							
Site 3	285	F 280				,			
Site4	280	F275							
Site 5	275	F 270							·
Site 6	275	270							
Site 7	280	275							
Site 8	275	265							
Site 9	780	770			Ţ				
Site 10	280	270							
Initials	The								
Date	10/22	<u> </u>						1	

FWSEDPAR.wk3

Client/Toxicant:	173
Job Number:	01-01
Species: C-	Hentuns .

Beginning Date & Time: Ending Date & Time:	20 9-3-03	1840
Ending Date & Time:	11-07-03	200

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

	` [Day					
Parameter	Concentration	441	45	4.6	47	48	49	50	51.	52	<i>53</i> ,	54
	Control				-		-	_	_	7		
	Site 1	23.0	22.0	220	22.5	24.0	23.0	32.0	22.0	20	23,0	23.0
Т	Site 2	23.0	22.0	22.0	22.5	24.0	23.0	22.0	22.0	22.5	23.0	23.0
Ε	Site3	23.0	22.0	22.0	22.5	24.0	23.0	22-0		~= <u>;</u>	-	_
M	Site 4	73.0	22.0	22.0	22.5	24.0	23.0	22.0	22.0	22.5	23.0	23.0
Р	Sites	23.0	22.0	22.0	22.5	24.0	23.0	22.0			`	. —
	Site6	23.0	22.0	22.0	22.5	24.0	23.0	22.0	22.0	52.5	23,0	ه. ډل
(C)	Site7	23.0	22.0	22.0	22.5	23.5	23.0	22.0	220	22.5	23.0	23.0
	5. te 8	23.0	22.0	22.0	22.5	23.5	23.0	22.0	22.0		23.0	23.0
	Silca	73.0	22.0	22.0	215	23.5	23.0	22.0	720	23. U	23.0	23.0
	SITER	23.0	22.0	22.0	20.5	23.5	73.0	22.0	220	226	23.0	23.0
	Control				_	_	_				_	
	Site 1	5.3	5.1	6.0	5.7	5.3	9.5	6.0	(01)	6,0	6.2	6.4
	Sited	5.5	5.2	5.9	6.1	5.3	5.4	6.0	Cerl	6.3	6.0	6.1
Dissolved		4.2	4.2	4.8	5.1	4.7	5.0	6.1	<u> </u>			
Oxygen	Site4	5.4	5.0	5.6	5.9	5.1	5.0	58	5.7	5.9	6.0	6.2
	Sites	5.3	4.3	4.4	4.9	4.2	5.1	5.6	<u> </u>			<u> </u>
(mg/L)	Site 6	5.3	4.3	4.9	5.2	3.5	4.3	5.0	5.2	5.0	6.0	6.1
	Sitet	51	4.5	5.6	5,9	4.6	4.8	5 2	5.6	5.3	5,6	6.0
	Site 8	5.0	4.1	14.6	15.2	4.8	5-2	5.9	(2)	5.8	5./	6.1
	Site9	4.9	4.0	5.0	5.5	4.1	4.4	5.3	12.8	5.9	10.0	12.8
	Site16	5-0	5.0	5.4	6.0	5.1	5.3	5.8	6.2	15.4	150	15.8
	Control		<u> </u>			\			7.0	100	-	 = -
	Sitel	7.6	127	7.7	F.8	8.0	17.7	7.8	7,8	1/1/	7.8	7.8
	Sites	7.6	7.7	12.3	7.8	8.0	7.9	7.8	7.8	1./	2.8	7.8
	Sites	7.4	17.5	7. 1	7.7	7.9	1 + 1 =	17.8	1=-	10/	07	75
-1.1	Site4	7.5	13.	7.7	7.8	7.8	155	7-8	7,7	7.6	27	7.8
pH	Site 6	7.6	14.5	7.7	78	17.8	17.8	7.8	7.7	100	2.7	7.8
	Sik7	7.6	7.5	7.6	7.8	7.8	7.5	177	11/	16	127	7.8
	Sites	7.6	7.5	7.6	7.8	7.8	12,3	7.7	15/	26	27	7.8
1.	Site9	7.6	74	1.7.6	7.7	120	1 2 3	7.7	1-1-	196	177	17.8
	5: te 10	75	15.4	13.6	7.7	177	1 1 1		17:7	127	177	7-8
!	Initials	TOP	ZD	and-	1.70/2	1	in	123	177	11/	11	mp
	Date	(0/1	7 10/19	10/1	7	0 10/2			10/24	10/30	19/6	10/27

	Cond. ("Alkalinit	y (mg/L)	Hardnes	s (mg/L)	Ammbni	a (mg/L)	Comments: O Day 63 un kss
Concentration	Initial ${oldsymbol{arOmega}}$	Final	Initial	Final	Initial	Final	Initial	Final	Comments: O Day 63 unless other wice marked with
Control		_							9 F for Final Conductivit
5.tel	F270								9 F for Final Conductivit @ Day 3065
Sik).		F295							
5/K3			1,			,			
Site4	_	-							
Sites	-	_							
Site6	280	F285							
Site 7.	270								
Sike8	F275	-							
Site9	2.70	F285							
S.H. 10.	F280	_				1			
Initials	7790	TAP		·				_	· ·
Date	VATIONS	11/2	1	1	1		1		

Hatch

Client/Toxicant:_	173	
Job Number:	01-01	
Species: C.	lentans	

Beginning Date & Time: 9-3-03 1840 Ending Date & Time: 11-07-08 12-00

Freshwater Sediment Test American Aquatic Testing, Inc., Physical / Chemical Parameters

			Day									
Parameter	Concentration	55	56	5.72	58	59	60	61	62	6.3	64	65
	Control		- 1	-	_	- 1	-				_	
	Site 1	23.0	23.0	22-0	22.0	23.5		-	_		-	-
Т '	Site 2		23.0		22.0	23.5	22.5	23.0	22.0	21.5		- .
Ε	Site 3	-		-	- 1		-		_			
М	Site 4	-		_	-		_		,			_
P	Site 5		_	-		_ ^		_	1	_	_	
	Site 6	23.0	23.0	32.0	22.0	73.5	22.5	33.0	22,0	22.5	22.5	23.0
(C)	Site 7	23.D	23.0	かつ	72.0	23.5	22.5	33.6	22.3	22.5	22.5	230
	Site 8		73.0	32.0	22.:	23.5	22.5	33.0				
	Site9	23.0	23.0	32.0	220	23.5	22.5	23. ن	22.5	22.5	22.5	23.0
	Sitelo	23.0	23.4	220				l. ~				
	Control			_		_			-	_	_	-
	Site 1	6.3	6.5	6.9	(e.g.	6.3						
	Site2	6.1	6.7	6.9	UX	6.5	7.6	6.8	7.3	7.1		
Dissolved										<u> </u>		
Oxygen	Site 4	<u> </u>						<u> </u>				-
	Site 5				_					<u> </u>		<u> </u>
(mg/L)	Site 6	[0.]	6.3	6.9	lule	6.6	1,5	6.9	6.9	7.0	6.9	6.4
	Site 7	5.9	6.1	6.5	6.5	6.5	48	6.7	6.6	(4.6)	6.5	6.2
	Site 8	5.9	6.0	6.7	6.2	6.4	69	6.5	<u> </u>	-	<u> </u>	-
	Site 9	5.8	6.0	6.8	6.6	6.5	1.0	6.7	7,0	6.9	7.0	6.3
	Site 10	5.8	5.9	0.8	<u> </u>			<u> </u>		<u> </u>	<u> </u>	<u> </u>
/	Control	-	\				<u> </u>	1	<u> ~ _ </u>	<u> </u>	_	
İ	Site 1	7.8	7.8	8.1	7.3	7.6		<u> </u>	<u> </u>	↓		<u> </u>
	Site 2	7.8	7.8	8.0	7.3	7.6	1.4	7.7	7.8	7.9		<u> </u>
	Site 3	1	 -		-		<u> </u>	1~	 	 	 	<u> </u>
	Site 4	<u> </u>			 -		 		 -		 	<u> </u>
pН	Site 5	7.6	<u>-</u>	8-	-	777	\ - -	1=-	100	-		 -
	Site 6	7.8	7.8	8.0	7.3	1 4 4	1).6		7.8	7.8	7.8	7.7
	Site 7	78	7.8	8.0	7.4	7.7	7.6	7.7	7.8	7,8	7.8	7.7
	Site 8	7.8	7.8	8.0	7.4	78	44	7.8	7.8	-	7 ~	+
•	51+C10		7.8	8:0	7.4	1 7.7	1-1-1	1.8	1.0	7,8	7.8	7.8
<u> </u>	Initials	no	100	100	The	TOP	+ 20	THE	AND.	1	ND	7000
	Date	10/28		- 1-2 1-3 x	10/31	11/1	145	11/3	11/4	11/5		11/2
	<u> </u>				11/1			~ ```			11/1	

	Cond.	(umhos)	Alkalinit	y (mg/L)	Hardnes	s (mg/L)	Ammoni	a (mg/L)	Comments:
Concentration	Initial	Final	Initial	Final	Initial	Final	Initial	Final	
Control	+							}	
Site 1	*						. *.		·
5 ite 1									
Site3	\						,		
Site 4	_	/							
Site 5									
Site 6									
Site 7									
Site 8	f			3.4					
Site9		1							
Site 10									
Initials			X					1	
Date	<u>L</u>	<u></u>		<u> </u>					

Freshwater Acute Test

American Aquatic Testing, Inc.
Start Date & Time: 9-3-03 1616

C. Tentans Species:

End Date & Time: 9-5-03 1710

Dilution Water: EPA Mod. Hard

Test Type: 48hr. SNR

Concentration	Rep.	· .	Live Count		Te	mperature (C)
		0 hr.	24 hr.	48 hr.	0 hr.	24 hr.	48 hr.
CONTROL	A	12	12	12	230	22.5	22.5
	В	12	(1)	12	23.0	22.5	22.5
625 ppm	Α	12	17	12	23.0	32.5	22.5
*	В	12	13	-17	23.0	33.5	22.5
1250 ppm	Α	12	15	12	23.0	22.5	22.5
	В	12	12	12	23.0	22.5	22,5
2500 ppm	Α	12	12	5 *	23.0	22-5	22.5
	В	12	15	66	23.0	225	22,5
5000 ppm	Α	12	92	0	23.0	22.5	22.5
	В	15	102	0'0	23.0	22.5	22.5
10000 ppm	A	12	0'2		23.0	23.5	_ `
	В	17	012	_	23.0	22.5	
Initials		TAP	TOP	TAP	DOP	709-	IMP
Date		9/3	9/4	9/5	9/3	9/4	95

Concentration	Aikalinity (mg/L)	Hardness (mq/L)				
Control	40	30				
10000 ppm	80	100				
Initiais	708	7096				
Date	9/3	9/3				

Concentration	pH (std	l units)	Dissolved Ox	cygen(mg/L)	Conductivity (umhos)		
	0 hr.	48 hr.	0 hr.	48 hr.	0 hr.	48 hr.	
Controi	7.5	7.5	7.7	8.1	280	300	
625 ppm	7.5	7.5	77	8.1	1500	1500	
1250 ppm	7.6	7.6	7.7.	8.1	2450	2500	
2500 ppm	7.6	7.7	ヌチ	8.1	4500	4500	
5000 ppm	7.7	7.8	77	8.	9000	9000	
10000 ppm	7.8	77.0	7.7	770	17000	18000 0	
Initials	Tops	me	TOP	W.	700	700	
Date	9/3	9/5	9/3	914	9/3	9/5	

Observations:	O Readings	done gt	24hrs. due to	total mort	ality	
	. 0			, .	,	
						

	,			Acute Fish Test-48	Hr Survival	
Start Date:	9/3/2003		Test ID:	kcctsu 16	Sample ID:	SRT #16 KCI
End Date:	9/5/2003		Lab ID:	AAT Inc	Sample Type:	Prepared
Sample Date: Comments:	· ·		Protocol:	EPAA 91-EPA Acute	Test Species:	D M -D aphnia magna CT. Chironomus tentans
Conc-ppm	1	2				
Control	1.0000	1.0000	1.			
625	1.0000	0.9167				
1250	1.0000	1.0000	1			
2500	0.4167	0.5000)			
5000	0.0000	0.0000	·		e a series	•
. 10000	0.0000	0.0000)	*.		

:			Tra			Number	Total			
Conc-ppm	Mean	N-Mean	Mean	Min	Max	CV%	N		Resp	Number
Control	1.0000	1:0000	1.4260	1.4260	1.4260	0.000	· 2		0	24
625	0.9583	0.9583	1.3520	1.2780	1.4260	7.741	2		1	24
1250	1.0000	1.0000	1.4260	1.4260	1.4260	0.000	2		0	24
2500	0.4583	0.4583	0.7435	0.7017	0.7854	7.962	2	4.5	13	24
5000	0.0000	0.0000	0.1448	0.1448	0.1448	0.000	2	•	24	24
10000	0.0000	0.0000	0.1448	0.1448	0.1448	0.000	2		24	24

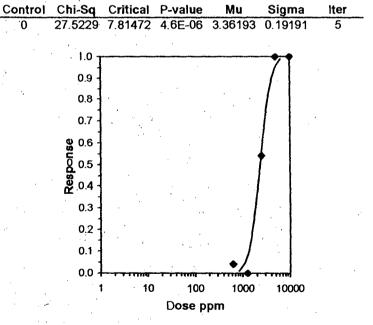
Auxiliary Tests	 Statistic	Critical	Skew Kurt
Normality of the data set cannot be confirmed			
Equality of variance cannot be confirmed			· .

Maximum Likeiihood-Probit Parameter Value SE 95% Fiducial Limits Control Chi-Sq Slope 5.21089 2.71215 -3.4204 13.8422 0 27.5229

-12.519 9.13578 -41.593 16.5555

TSCR			<u> </u>
Point	Probits	ppm	95% Fiducial Limits
EC01	2.674	823.171	1, / 1
EC05	3.355	1112.43	4
EC10	3.718	1306.15	
EC15	3.964	1455.57	
EC20	4.158	1586.42	,
EC25	4.326	1708.01	
EC40	4.747	2057.36	
EC50	5 ,000	2301.07	
EC60	5.253	2573.64	
EC75	5.674	3100.04	
EC80	5.842	3337.65	
EC85	6.036	3637.7	
EC90	6.282	4053.84	
EC95	6.645	4759.77	
EC99	7.326	6432.33	3

Significant heterogeneity detected (p = 4.57E-06)



Intercept



STL Edison 777 New Durham Road Edison, NJ 08817

Tel: 732 549 3900 Fax: 732 549 3679 www.stl-inc.com

11/11/2003

American Aquatic Testing, Inc. 1105 Union Blvd. Allentown, PA 10103

Attention: Mr. Chris Nally

Laboratory Results
Job No. P756 - Solids Testing

Dear Mr. Nally:

Enclosed are the results you requested for the following sample(s) received at our laboratory on September 25, 2003.

Lab No.Client IDAnalysis Required46460401TOCGrain Size

An invoice for our services is also enclosed. If you have any questions please contact your Project Manager, Heather Menzel, at (732) 549-3900.

Very Truly Yours,

Michael S. Ubes

Michael J. Urban Laboratory Manager



Mr. Chris Nally American Aquatic Testing, Inc. 1105 Union Blvd. Allentown, PA 10103 Report Date: 11/10/2003 Lab Job Number: P756

Lab Sample ID: 464604

Date Sampled: 08/26/2003

Date Received: 09/25/2003

Sample Description: Solids Testing - 01

	 Results	<u>Unit</u>	Det. Limit	Procedure	Lower Limit	Upper Limit	Analysis Date	Dilution
WET CHEM			-	*		**		
Total Organic Carbon	 30300	mg/kg	100	LLÓYD KAHN	••	••	09/29/2003	5.0

Particle Size of Soils by ASTM D422

Sample preparation method:

D2217

Client: Client Code:

STLNJE STLNJE

Project No.: Job No .:

23011 N/A

ETR(s) #: SDG(s):

96179 P756

Date Received: 29-Sep-03

Start Date: 29-Sep-03

End Date:

1-Oct-03

Lab ID: 543445

Sample 1D: 464604

Percent Solids: Specific Gravity:

Non-soil mass:

70.6% 2.65

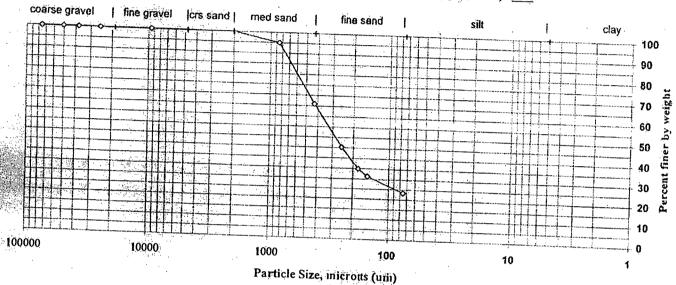
ŃΑ

(assumed)

Maximum Particle Size: Med sand

Shape (> #10): N/A

Hardness (> #10): N/A



Sieve	Particle	Percent	Incremental
size	size, um	finer	percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
l inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	100.0	0.0
#20	850	95.0	5.0
#40	425	ti6.0	29.1
#60	250	45.2	20.7
#80	180	34.9	10.3
#100	150	31.4	3.6
#200	75	23.3	8.0
Hydrometer	0.0	0.0	23.3
	0.0	0.0	0.0
1	0.0	0.0	0.0
	0,0	0.0	0.0
	0.0	0.0	0.0
	0.0	0.0	0.0
V	0.0	0.0	0.0

Soil Classification	Percent or Total Sample
Gravel	0.0
Sand	76.7
Coarse Sand	0.0
Medium Sand	34.0
Fine Sand	42.7
ines	23.3

Set Number P756

2

S43445

3

Client: STLNJE Clieat Code: STLNJE

Date Received: 29-Sep-03

5

Project No.: 23011

Job No.: N/A Start Date: 29-Sep-03

8

ETR(s) #: 96179

10

SDG(s): P756 End Date: 1-Oet-03

11

12

Date and Analyst

			<u> </u>	
Percent Solids	Weighed/Mixed	Hydrometer Large sieves	Non-soil	Small Sieve
CJC 9/30/03	CJC 9/30/03	(Sieve Only) <u>CJC 9/30/03</u>	CJC 9/30/03	CJC 9/30/0
CJC 10/1/03	CJC 9/30/03	CJC 10/1/03	CJC 10/1/03	CJC 10/1/0
	·		TOTALE OF THE	<u> </u>

Sieve Only. Analysis Requested: Hydrometer test not performed

6

Test number Lab number

Time, min. (2) Reading

Temperature, C

Time, min. (5)

Reading Temperature, C

Time, min. (15)

Reading

Temperature, C

Time, min. (30)

Reading

Temperature, C

Time, min. (60)

Reading

Temperature, C

Time, min. (250)

Reading

Temperature, C

Time, min. (1440) -

Reading

Temperature, C

Hydrometer used:	N/A%	Model #:	A PNARE	
Calibrations:	L temp, C	L read	H Temp, C	H read
·	N/A*	N/A	N/A	N/A

Manufacturer: Gal. Date:

Hydrometer start time: N/A Hydrometer data entered:

N/A

Clieat: STLNJE Client Code: STLNJE

Date Received: 29-Sep-03

Project No.: 23011 Job No.: N/A

Start Date: 29-Sep-03

ETR(s) #: 96179 SDG(s): P756 End Date: 10-1-03

Date and Analyst

:	Percent Solids	Weighed/Mixed	Hydrometer Large sieves	Non-soil	Small Sieves
	(3C 9135103	CJC7130103.	(Sieve Only)	C1C9130103	C3C9/33/5
	ac 10/1/02	Csc 9/35/03	CSC 10/1/03	coc 10/1/93	CEC 10/1/03

	,> (- 10111	03	Csc 71	20/02			20 1011	182 -	C 1011	102 00	- 10/1/07
Test number	1	2	3	4	5	6	7	8	9	10	1:1	12
Lab number	543445						1. Carrier 197					
Time, min. (2) Reading Temperature, C	Tur Tur								Phase .			
Time, min. (5) Reading Temperature, C					2011 - C		100 C 100 C	100 m 100 m				90
Time, min. (15) Reading Temperature, C												000
Time, min. (30) Reading Temperature, C				"Sieve C	only" Analys	is Requested	Hydromet	erdest pot pe	formed:			
Time, min. (60) Reading Temperature, C									22			

Temperature, C Hydrometer used:

N/A Model #: N/A Calibrations: L temp, C L read H Temp, C H read N/A N/A N/A N/A

Manufacturer: N/A Cal. Date: N/A

Hydrometer start time: Hydrometer data entered:

N/A N/A

Time, min. (250)

Reading Temperature, C Time, tnin. (1440)

Reading

SEVERN STL

Sample Preparation
And
Equipment Calibration
Information

0007

STL Edison

Particle Size Analysis Sieve Data	Client Code	:: ESTENIE :: ESTENIE ::		2.961 79 7.2 . 975 6 7			(230) 1/47 (230) 1/47	Date Rec:	29-Sep-03		29 Sep-03	9
	SET:	3CP756.0										
	Test Laboratory No	1 5434457	2 3	4 5	6	7	8 33:33:44 (5.00)	9	10 10	11	12 10885-145	
	Sample ID	464604										
Dry prep = D42 i			***************************************	er territoria de la compresión de la compresión de la compresión de la compresión de la compresión de la compre		Rámbinsian na saith Blunn (1. daoine	e uder 10.1464 v. 10. 1001/00.00	Marie State State Control Stat	Carte de manifesant : 111 min no	Second St. o. th. m. c. c.	1 1900	
Wet prep = D2217	Sample Prep Metho	d D2217	•					•				
Sundard	Pan, g Pan/sample, g	77.120.437									"SECTION SECTION	
Values	Pan/dry sampl, g	****								ACTO CONTRACTOR	- elimentarilles	•
Sieve Opening, um				:				*				
3 inch 75000	Non-soil material					 De de marco de l'Arrico de	enichasian kangganasa	na na na na na na na na na na na na na n	rdes en des en des en de la companya de la companya de la companya de la companya de la companya de la companya	unakosa sekerpensi seren	Ind Maker Janes	
2 inch 50000 1.5 inch 37500	Description	1 NA										
l inch 25000	Pan, g Pan/dry sampl, g	-										
3/4 inch 19000	Non-sdil, g	marama yeren				and the second				(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	in and the Control of the Control	
3/8 inch 9500		ure correction fi	ctor (HMCF) for dry pre	p / Percent Solids for di	ry: and wet prep		•	,				
#4 4750	Pan, g	0.99										
#10 2000	Pan/sampie, g	68,75										
#20	Pan/dry sampl, g	48.85								Section 1	860 (B. 1987)	
#40 425 #60 250	HMCF	100.0%	•									
#80 180	Sample % Solids	70.6%									α	٠.
#100 150					-						C	Ö
#200 75	Sample used, g	85.06		*							ÛNNA	.H
in the second se								•			Ç	Edison
Sieve (tares) Size Mass, g	Sieve + Sample Wei Size	A. 14	Mass, g Mass, g	المنافقة المعاقبة	. sistema		News at	A Australia	A Const.	wain.		
3 inch	3 Inch	iviass, R	Mass, g Mass, g	Mass, g Mass, 1	g Mass, g	Mass, g	Mass, g	Mass, g	Mass, g	Mass, g	Mass, g	STL
2 inch	2 inch											CΩ
1.5 inch	1.5 inch											
l inch	1 inch											
3/4 inch	3/4 inch											
3/8 inch #4	3/8-inch #4											
#10 43734	#10	m -										
#20 #385.42 D	#20	389.64				and the second						
#40 345.53 D	#40	1-1371/41 19File					100				28.4	
#60 2 326 70 D	#60	9. 9.44 (1) (2)										
#80 - 1319 05 D	#80	32181.5										
#100	#100						90					
#200 22 <i>6</i> 99 D	#200	(2122222)					and the second					
	Maximum Particle s			andario de la composición dela composición de la composición de la composición de la composición de la composición dela composición de la composición de la composición dela composición dela composición de la composición dela composición de la composición dela composición dela compo				, '				
	Description of >#10	Med sand		en en en en en en en en en en en en en e								
	Shape		Magazeryante	ZNA POTOKIA		ANIA S	NA PURE		N/A S	N/A	N/A	
	Hardness	i Wases	NA SENTA	NAT'S ELECTION	NA SE		NA S	NA S	NA.		NA.	
	Sample Msss Param	1 (1 () () () () () () () () (CALCULATION OF STREET	processor we the best to the terminal to the second second second second second second second second second se	ATT ATT ATT ATT ATT ATT ATT ATT ATT ATT	popula incient i Propinsi il inglici p	en inerioritation distribution (1) 500	n salati, mitji t	
	Pan/sainpie, g	120.43		e S	•			•				10
	Mass rempved, g	0.00	0.00	0,00 0,00	0.00	0.00	0.00	0.00	0,00	0:00 ~	0.00	56
	Sampie mass, g	85.06		. •								P75
1000003				CTI r					•			•
10/2/2003				STL		•			•	P75	ves	

Balance Calibration Log

Type:	Mettler PB3002-S
Serial #:	1120173088
Asset #:	n/a
Location:	Soils Lab
Calibrate to:	2000g

		Calibration	
Date	Time	Weight	Initials
01-Sep-03	07:00	1000.00	DY
02-Sep-03	06:50	2000,00	NO
03-Sep-03	03.00	2000.00	DW
04-Sep-03	0615	عان ربدو 2	cs c_
05-Sep-03	C600	2000,00	DMA
08-Sep-03	CLSO	2000,00	MAO
09-Sep-03	BLR	2000.00	MV
10-Sep-03	0675	2000.00	MVO.
11-Sep-03	(1635	2000,00	وتحد
12-Sep-03	0630	2000,00	CVIM
er as the		19-20	
30 80 10			2026
15-Sep-03	c612	2000.00	MV
16-Sep-03	10:20	2000:00	M

Date	Time	Calibration Weight	Initiais
17-Sep-03		2000.00	DOD
18-Sep-03		2000.00	C2.c.
19-Sep-03		2000 00	(50
A U Serials			
Selection in		Account the second	
22-Sèp-03		200.00	<u>Crc</u>
23-Sep-03	0745	Z∞0,(∪	WED
24-Sep-03			CSC
25-Sep-03	0728		c2C
26-Sep-03	0728	200000	CSC.
28.56			
29-Sep-03	830	2000.08	CsC
30-Sep-03	0800	2000.00	<i>رن نـ</i>
01-Oet-03			
1			

Oven #1 Quality Control Log

Type:	Baxter/Scientific Products (H6620-13A)
Serial #:	1090-0313
Asset #:	N/A
Location:	Soils Lab
Calibration Range:	110°C ±5

Date	Temperature	Oven Setting	Initials
01-Sep-03	115°	5.6	NΥ
02-Sep-03	110	5.4	C5 C-
03-Sep-03	110	2.2	DY
04-Sep-03	110	22	CSC
05-Sep-03	loš	6.0	DWA
	BUIDE SE		A WA
08-Sep-03	n5"	5.6	Mag
09-Sep-03	llo.	<u>ځ,ځ</u>	MM
10-Sep-03	115°	ઈ.ઇ	WIP .
11-Sep-03	117.	5.8	ر <u>ء</u> ر
12-Sep-03	Nos .	કે.ઇ	WLO .
15-Sep-03	110	6.0	MM
16-Sep-03	110	2.0	ON

			
		Oven	
Date	Temperature	Setting	Initials
17-Sep-03	1050	12:38	CSC
18-Sep 03	1140	5.6	Csic
19-Sep-03	108°	(1.7	CC.
24.56.60			
2 377		77.7	
22-Sep-03	701	5.0	CSC
23-Sep-03	105	50	USL
24-Sep-03	1140	5.0	CSC_
25-Sep-03	1000	5.0	CSL
26-Sep-03	1080	5.0	CJC
2725 biles			7.5
25 on Ele		24.5	
29-Sep-03	116	S-0	<5C
30-Sep-03	110	5.0	W.
01-Oct-03			•

Oven #2 Quality Control Log

Type:	Baxter/Scientific Products (H6620-13)	١)
Serial #:	0292-0485	
Asset #:	3333	2
Location:	Soils Lab	
Calibration Range:	110°C ±5	

وخنيف سنتسبخ بينان			
Date	Temperature	Oven Setting	Initials
	z ozapot a caro		
01-Sep-03	113	6.0	DTY
02-Sep-03	109°	600	C5C
03-Sep-03	110	600	DTP
04-Sep-03	1101	6.0	C5C
05-Sep-03	115.	6.0	DMA
201351			1 /16
	\$46.50 Sec. 15.00		
08-Sep-03	110	6.0	MIZO
09-Sep-03	115.	رت, ع)	MAD
10-Sep-03	115.	6.0	MM
11-Sep-03	1,20	0.0	CIC
12-Sep-03	105	6,0	MAD
(15 - Ne o (0)			
15-Sep-03		6.0	WBO,
16-Sep-03	1150	60	OTT

Date	Temperature	Oven Setting	Initiais
17-Sep-03	115		(5)
18-Sep-03	(11)	ه بط ص	(3 <u>)</u>
19-Sep-03	1083	6.0	CX
20356508			
WESSHAW.			
22-Sep-03	1090	ba	c8<
23-Sep-03	108	6.0	MiN
24-Sep-03	1084	60	c sc
25-Sep-03	1050	1.0	csc
26-Sep-03	110	(0.5)	CTC
		1000	
200			1.50,00
29-Sep-03		6.0	C-2.C
30-Sep-03		60	CVZ
01-Oct-03			_
		<u> </u>	<u> </u>

Balance Calibration Log

Type:	Mettler PB3002-S	
Serial #:	1120173088	
Asset #:	n/a	
Location:	Soils Lab	
Calibrate to:	2000g	

·····		The second second second second second second second second second second second second second second second se	
Date	Time	Calibration Weight	Initials
01-Oct-03	08 00	2000,00	UTP
02-Oct-03	C630	2300 20	C52_
03-Oct-03			
04-0 et 08			7.0
05. Oct-03			100
06-Oct-03			
07-Oct-03			
08-Oct-03			
09-Oct-03			
10-Oct-03		Article Control	
s14-061-03	-11-18-4 (44.37	100
.k2-Oct 08			4,000
13-Oct-03			
14-Oct-03			
15-Oct-03			1
16-Oct-03			

		and the state of t		
	Date	Time	Calibration Weight	Initials
1	17-Oct-03		umu asimis in inc	1 % +-
-	4.18-00£03			
	k 19 roet op		* 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	
	20-Oct-03			H P
	21-Oct-03			
	22-Oct-03			
	23-Oct-03			
	24-Oct-03			
	25 (0)(1-03			2 201
	26-000-08		Sec. 16.	1841
5	27-Oct-03			
	28-Oct-03			
	29-Oct-03	<u> </u>		
٠:	30-Oct-03		<u> </u>	
	31-Oct-03			
	A. A.			

Balanee Calibration Log

Type:	Mettler Toledo PB3002
Serial #:	1116283195
Asset #:	N/A
Location:	Soils Lab
Calibrate to:	2000g

Date	Time	Calibration Weight	Initials	Date	Time	Calibration Weight	Initials
01-Oct-03	08:01	2000.00	W	17-Oct-03	e e e e e e e e e e e e e e e e e e e		
02-Oct-03	063h	2000,00	Cac	018-00 E08		100	
03-Oct-03				10:00163		1,000	
02 001 03		100		20-Oct-03			
0.7400000		1000		21-Oct-03			·
0 6 -Oc t -03				22-Oct-03			·
07-Oct-03				23-Oct-03		·	
08-Oct-03				24-Oct-03	√ National	11.5	
09-Oct-03		·		25 Oct 0.7		1.05	
10-Oct-03				267076703		100	100
File (0)(120)				27-Oct-03	Augre 3		
(12-Oct-08				28-Oct-03	•		
13-Oct-03				29-Oct-03			
14-Oct-03				30-Oct-03			
15-Oct-03				31-Oct-03			
16-Oct-03	3	1,111					

Oven #1 Quality Control Log

Type:		Baxter/Scientific Products (H6620-13A)
Serial #:		1090-0313
Asset #:		N/A
Location:		Soils Lab
Calibration 1	Range:	110°C ±5

		Oven	
Date	Temperature		Initials
01-Oct-03	115°	5.1	יצנט
02-Oct-03	1100	5.1	Cac
03-Oct-03			
04606-0			
0.5000 1206		130	
06-Oct-03			
07-Oct-03			
08-Oct-03			
09-Oct-03			
10-Oct-03	a de la companya de la companya de la companya de la companya de la companya de la companya de la companya de		
0.001			16.00
12-00400			
13-Oct-03			
14-Oct-03			
15-Oct-03			e:
16-Oct-03			

Date	Tomonostiino	Oven	Yalifala
	Temperature	Setting	Initials
17-Oct-03			
28 - OG 148	and the second		
15 a (0.18)			
20-Oct-03			·
21-Oct-03			
22-Oct-03			·
23-Oct-03			
24-Oct-03			
25 OH 05			
26101110			9.5
27-Oct-03			
28-Oct-03	,		
29-Oct-03			
30-Oct-03			T
31-Oct-03		<u> </u>	

Oven #2 Quality Control Log

Type:	Baxter/Scientific Products (H6620-13A)
Serial #:	0292-0485
Asset #:	3333
Location:	Soils Lab
Calibration Range:	110°C ±5

		Oven	
Date	Temperature	Setting	Initials
01-Oct-03	1143	5.9	VJY .
02-Oct-03	1100	S. I	cs-
03-Oct-03			
0.5 (0.0 (0.0)			
06-Oct-03			
07-Oct-03			
08-Oct-03			
09-Oct-03			
10-Oct-03			
H 1 (1)			
12 (181-93)			
13-Oct-03	78.0		
14-Oct-03			
15-Oct-03			
16-Oct-03			

· · · · · · · · · · · · · · · · · · ·		Oven	
Date	Temperature	Setting	Initials
17-Oct-03			,
0.000	A Property of		
\$10500 d 15			
20-Oct-03			
21-Oct-03			
22-Oct-03			
23-Oct-03			
24-Oct-03			
2520(10)			
20:00d 08			
27-Oct-03			
28-Oct-03			
29-Oct-03			
30-Oct-03			
31-Oct-03	<u> </u>	·	
	1		

Sodium Hexametaphosphate Quality Control Log

Date			Mfg./Supplier	Lot#	Exp. Date*	Initials
9.2207	3L	120g / 3L H20	Fr SciEnce	42246238	09-02-04	MAD
9.23.62	91	120g / 3L H20			D9-02-04	CAM
9.25.63	64	120g / 3L H20	EM SCIENCE	42246238	9.2.4	LST
430.03	121	120g / 3L H20	A 11	**	09-02-04	MP
		120g/3L H20				
		120g/3L H20				
		120g / 3L H20				
		120g / 3L H20	•			
		120g / 3L H20				
		120g / 3L H20				
		120g/3L H20				
		120g/3LH20				
		120g/3L H20				
		12 0 g / 3L H20				
		120g / 3L H20				
		12 0 g / 3L H20				
		120g/3L H20				
		120g/3L H20				
	, ·	120g/3L H20				
		120g/3L H20				
		120g/3L H20	,			
		120g/3L H20	·			
		120g/3L H20				
		120g / 3L H20				
		120g / 3L H20				
		120g/3L H20	·			
		120g/3L H20				
		120g/3L H20				
		120g / 3L H20				
		120g/3L H20				
		120g / 3L H20	-			

Note: * No expiration date noted on container. Date is one year from opening.

STL Burlington

CalSheetMstr:Sod. Hex. ENV.0010.111099

1,5

SEVERN STL

SAMPLE HANDLING

ORIGIN ID LOJA 732) 549-3900 STL EDISON SEVERN TRENT LABS INC. 777 NEW DURHAM RD

SHIP DATE: 265EP03 SYSTEM #0608500 / CREE2165 ACTUAL WGT 4 LBS MAN-WGT ACCOUNT #: 237255912

EDISON, NJ 08817

FedEx

TO:



SAMPLE RECEIVING (S02) 655-1203 STL BURLINGTON 208 SOUTH PARK DRIVE SUITE 1 COLCHESTER, VT 05446

REP:



PRIORITY OVERNIGHT

4783 2077 5966 FORM

MON 29SEP03



0019

STL Edison

SEVE	RN TRENT LAI	BORATORIES LO	G-IN SHEE	T - Form D	C-1 Page 1 of 1
Received By (Print or Type Name): Jennifer J. Guy	Λ I	·		Log-in Date: 09/29/03
	mule.	there			
Case Number:	23011	~ 0			
Sample Delivery Group No.:	P756		CORRESPO		REMARKS: CONDITION
ETR Number:	96179	CLIENT SAMPLE#	SAMPLE TAG#	ASSIGNED LAB#	
REMARKS:		464604	NA NA	543445	
1. Custody Seal	Absent*				
2. Custody Seal Nos:	NA				
3. Chain-of-Custody Records	Present				
4. Sample Information Sheets	Absent*				
5. Airbill Present	As Sticker	611	6110	102	
6. Airbill Number(s):	478320775966		201101	12-	
7. Säinple Tags	Absent*				
	NÃ				
9. Sample Condition:	Intact				
0. VOA Vial Bubbles	N/A		-		
11. Does info on the custody					
records, sample lafo sheets,	Yes				
sample tags and labels agree	?				
12. Date Received at Lab:	09/29/03				
13. Time Received at Lab:	1000				
14. Cooler Temperature(s):	17 C				
SAMPLE TRANSFER:					
Fraction(s):	ALL				
Area Number:	Level 4 Storage				·
Transferred By:	ıLG				
Transferred On:	09/29/03				
•	•				
	•				
`					
				-	
		200	<u> </u>		

STL Edison

P756

18

STL Burlington COCLER RECEIPT CHECKLIST

Date Received: <u>1929.03</u> Sample Custodian: <u>16</u>	
Time Received: 1000 ETR/SDG: 91479/P7	30
RADIATION SCREEN: <0.05 MR/HR If yes, stop work and alert the Supervisor and the PM.	NO NO
CUSTODY SEALS PRESENT: YE	S (NO
If yes, were the custody seals signed?	s (NO
If yes, are custody seal numbers present?	S NO
List custody seal numbers:	
TEMPERATURE CHECK:(°C) Acceptance Criteria (0-6°C) except air samples, which should lie shipped at ambient and/or biota/tissue samples, which may be frozen on receipt. The thermal preservation that are hand delivered immediately following collection is considered acceptable if the that the chilling process has begun. Thermal Preservation Type: ICE ICE PACK NCCONDITION OF SAMPLE CONTAINERS: NTACT BE	on of samples
Were any samples received with a short hold time* ren * <7 Days WET CHEMISTRY METALS ORGANIC EXTRACTABLES VOLATILE (received unpreserved) If yes, expedite sample log in procedure and aiert the appropriate Department	

19

STL EDISON

31 L EDISON 777 New Durham Road		O L		. 6116		 .			/ ^ .		-		0.7	a				
Edison, New Jersey 08817 Phone: (732) 549-3900 Fax: (732) 549-	3679	GH/	AIN OF	ะยร	IUL) Y /	AN	AL'	YSE	5 K	EW	UE:	51		•	. da	PAGE_	OF
Name (for report and invoice)		Sai	Samplers Name (Printed):				Site/Project Identification							- P756				
company STL-Edison		P.C	P.O. #					State (Location of site): NJ: NY:						Ď	Othe	r:		
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2			10002A	<u> </u>						190 - 190								
Preservation Used: 1 = ICE, 2 = HCl, 6 = Other	3 = H₂SO₄. 4 = , 7 = Other_	HNO ₃ , 5 =	= NaOH	Soll: Water:														-
Special Instructions	Siev	e C	nly		Property of the second		<u> </u>		Ω			W	ater M	etals F	iltere	d (Yes	/No)?	
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3) Relinquished by	Company) ate / Time	النسينين	3) Receiv	ved by	<u> </u>		· · · · ·			Comp	anv			ar en el cita de la	
istemidaished by	Joniparij			1	1		ر برت حار							7.7				

610 434		PA 18		<u> </u>	-	· P7	56	Address: Phone #:				t Contact Sample <u>Disposal:</u>	Reta	ıra to c disposa	lient	
Sample #	Temp	Dis		Chemistr boratory Alk	Hard	CI.	Sam	SA ole Identification	MPLE IN Sample	Sample	Sample	Sample		ity Testi	ng Requ	Othe
ر اه		0,		mg/L	T/Sm	mg/L	3L3	SAMPLE #	Type Gmp	Volume Scoric	Date 08/26/03	Sample Nitiolog/ 464604) W
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Collected b		persom	iei	, Re	t 2] ceived	Yes 🗶 by:	No [CUST Date	DBY INFORM	ස [)	No []		nple matrix is:		iquid {] { oil	Other 1 Lab] Use
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Collected b	Client	persom	iei	, Re] ceived	Yes 🗶 by:	No [CUST Date	DBY INFORM	es [Ŋ es [Ŋ	No []			S	oil []	Other 1 Lab] Use
Collected b	Client	persom	iei	, Re] ceived	Yes 🗶 by:	No [CUST Date	DBY INFORM	es [Ŋ es [Ŋ	No []			S	oil []	Other 1 Lab] Use
Collected b	Client	persom	iei	, Re] ceived	Yes 🗶 by:	No [CUST Date	DBY INFORM	es [Ŋ es [Ŋ	No []			S	oil []	Other 1 Lab] Use
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Collected b	Client	persom	iei	, Re] ceived	Yes 🗶 by:	No [CUST Date	DBY INFORM	es [Ŋ es [Ŋ	No []			S	oil []	Other 1 Lab] Use

DATA REPORTING QUALIFIERS

- The compound was not detected at the indicated concentration.
- > The compound exceeded the indicated concentration.
- ** Not included in initial calibration.
- E Estimated concentration for non target compound.
 - Tentatively Identified Compounds (TIC).

MICROBIOLOGY DATA REPORTING QUALIFIERS

Present - Presence of bacterial genus.

Absent - Absence of bacterial genus.



Nonconformance Summary

STL Edison Job Number: P756

Client: American Aquatic Testing, Inc.

Date: <u>11/10/2003</u>

Sample Receipt:

Sample delivery conforms with requirements.

Wet Chemistry \ Microbiology:

All data conforms with method requirements.

Sub Work:

See STL Burlington case narrative

I certify that the test results contained in this data package meet all requirements of NELAC both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this package has been authorized by the Laboratory Manager or his designee, as verified by the following signature.

Sharon Ercoliani for

Michael J.Urban
Laboratory Manager

STATISTICAL DATA FOR Chironomus tentans FIRST EMERGENCE WITH CONTROL & REFERENCE SEDIMENTS

Table I: Average Time to First Emergence; Matteo Metals Start Date 09/03/03

Comparison to Reference Sites 8 and 9 Included

Site ID	Ave. # days	% of 65 day	Significant	Significant
	to 1st Emergence	Exposure	VS. Site 8?	VS. Site 9?
Control	29.2	44.9	N/A ¹	N/A ¹
3	51.2	78.8	YES ²	YES ²
4	41.6	64.0	No ·	No
5	40.8	62.8	No	No
6	36.6	56.3	No	No
7	33.6	51.7	. No	No
8	31.4	48.3	-	N/A ¹
9	30.8	47.4	N/A ¹	_
10	31.2	51.1	No	No

^{1 -} Control sample not included in Site analysis

²⁻ Site 3 significant delay to 1st emergence vs Reference sites 8 and 9

e: d:\toxstat\1730101e.me8 Transform: 1/(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP ID	ENTIFICATION	N	MIN	MAX	MEAN
1	Ref. Site 8	5	1.403	1.523	1.441
2	Site 3	5	1.000	1.523	1.185
3	site 4	, 5	1.000	1.403	1.280
4	Site 5	5	1.000	1.403	1.295
5	Site 6	5	1.229	1.426	1.340
6	Site 7	5	1.291	1.471	1.396
7	Site 10	5	1.363	1.497	1.402

Matteo Metals 1st Emergence start date 09/03/03

File: d:\toxstat\1730101e.me8 Transform: 1/(SQUARE ROOT(Y))

				*	
GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
	Ref. Site 8	0.002	0.047	0.021	3.28
2	Site 3	0.066	0.257	0.115	21.70
3	site 4	0.027	0.163	0.073	12.73
4	Site 5	0.028	0.167	0.075	12.87
5	Site 6	0.008	0.089	0.040	6.68
. 6	Site 7	,0.006	0.079	0.035	5.68
. 7	Site 10	0.003	0.056	0.025	3.98

Data PASS Bl homogeneity test at 0.01 level. Continue analysis.

181 EMERGENCE USING SITE 8 AS REFERENCE

e: d:\toxstat\1730101e.me8 Transform: 1/(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	 0.232	0.039	1.932
Within (Error)	28	0.561	0.020	
Total	34	 0.793		· • • • • • • • • • • • • • • • • • • •

Critical F value = 2.45 (0.05,6,28)

Since F < Critical F FAIL TO REJECT Ho: All equal

Matteo Metals 1st Emergence start date 09/03/03

File: d:\toxstat\1730101e.me8 Transform: 1/(SQUARE ROOT(Y))

. Г	OUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <treatment< th=""></treatment<>			
COUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT SI	IG	
1 2 3 4 5 6 7	Ref. Site 8 Site 3 site 4 Site 5 Site 6 Site 7 Site 10	1.441 1.185 1.280 1.295 1.340 1.396 1.402	0.483 0.788 0.640 0.628 0.563 0.517 0.511	2.854 * 1.790 1.632 1.126 0.499 0.432		

Dunnett table value = 2.43 (1 Tailed Value, P=0.05, df=24,6)

Matteo Metals 1st Emergence start date 09/03/03

File: d:\toxstat\1730101e.me8 Transform: 1/(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2	OF 2	HC.	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS		mum Sig Diff ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1 2 3 4 5 6 7	Ref. Site 8 Site 3 site 4 Site 5 Site 6 Site 7 Site 10	5 5 5 5 5 5 5	Tw.	-0.187 -0.187 -0.187 -0.187 -0.187	-38.6 -38.6 -38.6 -38.6 -38.6 -38.6	-0.305 -0.157 -0.145 -0.080 -0.034 -0.028

TLE: Matteo Metals 1st Emergence start date 09/03/03 d:\toxstat\1730101e.me8
TRANSFORM: 1/(SQUARE ROOT(Y)) NUMBER OF GRO

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1 1 1 1 1 1 2 2 2 2 2 2 3 3 3 3 4 4 4 4	Ref. Site 8 Ref. Site 8 Ref. Site 8 Ref. Site 8 Ref. Site 8 Site 3 Site 3 Site 3 Site 3 Site 4 Site 4 Site 4 Site 4 Site 5 Site 5 Site 5 Site 5 Site 5	1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1	0.4920 0.5080 0.4920 0.4310 0.5080 1.0000 1.0000 0.4310 0.5230 0.6000 1.0000 0.5540 1.0000 0.5540 1.0000 0.5540 1.0000 0.5540 1.0000	1.4257 1.4030 1.4257 1.4257 1.5232 1.4030 1.0000 1.0000 1.0000 1.5232 1.4030 1.3828 0.12910 0.13435 0.13435 0.13435 0.13435	
5 5 5 5 6 6 6 6 6 7 7 7 7 7 7 7 7 7 7 7		•		0 1.2291 0 1.4030 0 1.3828 0 1.4257 0 1.2589 0 1.4712 0 1.3435 0 1.4030 0 1.3634 0 1.3828 0 1.4974	

File: d:\toxstat\1730101E.MER Transform: 1/(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Ref. Site 9	5	1.403	1.523	1.454
Ż	Site 3	5	1.000	1.523	1.185
3	site 4	5	1.000	1.403	1.280
4	Site 5	5	1.000	1.403	1.295
5	Site 6	5	1.229	1.426	1.340
6	Site 7	5	1.291	1.471	1.396
7 ·	Site 10	.5	1.363	1.497	1.402

Matteo Metals 1st Emergence start date 09/03/03

File: d:\toxstat\1730101E.MER Transform: 1/(SQUARE ROOT(Y))

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
	Ref. Site 9	0.003	0.051	0.023	3.54
	Site 3	0.066	0.257	0.115	21.70
3	site 4	0.027	0.163	0.073	12.73
4	Site 5	0.028	0.167	0.075	12.87
5	Site 6	0.008	0.089	0.040	6.68
6	Site 7	0.006	0.079	0.035	5.68
7	Site 10	0.003	0.056	0.025	3.98

```
Transform: 1/(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.562

W = 0.957

Critical W (P = 0.05) (n = 35) = 0.934

Critical W (P = 0.01) (n = 35) = 0.910

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals 1st Emergence start date 09/03/03

File: d:\toxstat\1730101E.MER Transform: 1/(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 15.25

Table Chi-square value = 16.81 (alpha = 0.01, df = 6)

ble Chi-square value = 12.59 (alpha = 0.05, df = 6)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
```

1 ST EMERGENCE USING SITE 9 AS REFERENCE

le: d:\toxstat\1730101E.MER Transform: 1/(SQUARE ROOT(Y))

	_				
SOURCE		DF	SS	MS	F
Between		6	0.247	0.041	2.054
Within (E	rror)	28	0.562	0.020	
Total		34	 0.810		

Critical F value = 2.45 (0.05,6,28)

Since F < Critical F FAIL TO REJECT Ho: All equal

Matteo Metals 1st Emergence start date 09/03/03

File: d:\toxstat\1730101E.MER Transform: 1/(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <t< th=""><th>reatment.</th><th></th></t<>	reatment.	
CPOUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Ref. Site 9		0.474		
2	Site 3	1 185	0.788	3 003	*

site 4 0.640 Site 5 1.295 0.628: Site 6 1.340 0.563 Site 7 1.396 0.517

(1 Tailed Value, P=0.05, df=24,6) Dunnett table value = 2.43

Matteo Metals 1st Emergence start date 09/03/03

File: d:\toxstat\1730101E.MER Transform: 1/(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2	OF 2 Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1 2 3 4 5 6	Ref. Site 9 Site 3 site 4 Site 5 Site 6 Site 7	5 5 5 5 5 5	-0.181 -0.181 -0.181 -0.181 -0.181	-38.2 -38.2 -38.2 -38.2 -38.2	-0.314 -0.166 -0.154 -0.089 -0.043
- 7	Site 10	5	-0.181	-38.2	-0.036

TLE: Matteo Metals 1st Emergence start date 09/03/03
LE: d:\toxstat\1730101E.MER
TRANSFORM: 1/(SQUARE ROOT(Y)) NUMBER OF GR

GRP	IDENTIFICATION REP	VALUE	TRANS VALUE	
1	Ref. Site 9 1	0.5080	1.4030	٠.
.1	Ref. Site 9 2 Ref. Site 9 3	0.4310 0.5080	1.5232	
1	Ref. Site 9 3	0.3080	1.4030 1.4712	
1	Ref. Site 9 5	0.4620	1.4712	
2	Site 3 1	0.5080	1.4030	
2	Site 3 2	1.0000	1.0000	
2	Site 3 3	1. 0 000	1.0000	
. 2	Site 3 4	1.0000	1.0000	
2.	Site 3 5	0.4310	1.5232	
	site 4 1	0.5080	1.4030	
3 3 3	site 4 2	0.5230	1.3828	
	site 4 3	0.6000	1.2910	
3	site 4 4	1.0000	1.0000	
3	site 4 5	0.5690	1.3257	
4	Site 5 1	0.5540	1.3435	
4	Site 5 2	1.0000	1.0000	
4	Site 5 3	0.5540	1.3435	
A	Site 5 4	0.5080	1.4030	
	Site 5 5	0.5230	1.3828	
	Site 6 1	0.6620	1.2291	
5	Site 6 2 Site 6 3	0.5080	1.4030	
5 5	Site 6 3 Site 6 4	0.5230 0.4920	1.3828	
5 5	Site 6 5	0.4920	1.4257 : 1.2589	
6	Site 7 1	0.4620	1.2389	
6	Site 7 2	0.4620	1.4712	
6.	Site 7 3	0.5540	1.3435	
6	Site 7 4	0.5080	1.4030	
6	Site 7 5	0.6000	1.2910	
. 7	Site 10 1	0.5380	1.3634	
7	Site 10 2	0.5080	1.4030	
7	Site 10 3	0.5230	1.3828	
7	Site 10 4	0.4460	1.4974	
7	Site 10 5	0.5380	1.3634	
	-			

STATISTICAL DATA FOR Chironomus tentans

EMERGENCE USING REFERNCE STATION 8

```
Matteo Metals Total Emergence @ Day 44 w/Ref 8
File: d:\toxstat\1730101t.e84 Transform: ARC_SINE(SQUARE ROOT(Y))

apiro - Wilk's test for normality

D = 0.643

W = 0.980

Critical W (P = 0.05) (n = 35) = 0.934
Critical W (P = 0.01) (n = 35) = 0.910

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Emergence @ Day 44 w/Ref 8
File: d:\toxstat\1730101t.e84 Transform: ARC_SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 9.89

Table Chi-square value = 16.81 (alpha = 0.01, df = 6)
Table Chi-square value = 12.59 (alpha = 0.05, df = 6)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
```

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN	· ·	• •	
1	Ref. Site 8	5	0.705	0.866	0.769			
2	Site 3	- 5	0.145	0.287	0.202	·		
3	site 4	5	0.145	0.612	0.396			
4	Site 5	5	0.145	0.705	0.389			
5	Site 6	5	0.287	0.785	0.617		•	
6	Site 7	5	0.412	0.705	0.555			
7	Site 10	5	0.412	0.612	0.519		· .	

Matteo Metals Total Emergence @ Day 44 w/Ref 8

File: d:\toxstat\1730101t.e84 Transform: ARC SINE(SQUARE ROOT(Y))

				•		
GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %	
	Ref. Site 8 Site 3	0.008 0.006	0.088 0.078	0.039	11.44	
3	site 4	0.035	0.186	0.083	46.96	
4 5	Site 5 Site 6	0.050 0.046	0.223 0.213	0.100 0.095	57.21 34.58	•
6 7	Site 7 Site 10	0.012 0.005	0.110 0.071	0.049 0.032	19.80 13.71	
, 	5166 10	0.005	0.071	0.03Z	12.11	

		4.4		•	
SOURCE	DF	SS	MS	F	
Between	6	1.007	0.168	7.313	
Within (Error)	28	0.643	0.023		
Total	34	1.650			

Critical F value = 2.45 (0.05,6,28) Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Emergence @ Day 44 w/Ref 8

File: d:\toxstat\1730101t.e84 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST	- TABLE 1 OF 2	Ho:Control <treatment< th=""></treatment<>

OUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Ref. Site 8	0.769	0.484		
2	Site 3	0.202	0.032	5.925	*
3	site 4	0.396	0.164	3.899	*
4	Site 5	0.389	0.166	3.965	*
5	Site 6	0.617	0.350	1.587	
6	Site 7	0.555	0.282	2.235	
7	Site 10	0.519	0.248	2.614	*
	•				

Dunnett table value = 2.43 (1 Tailed Value, P=0.05, df=24,6)

Matteo Metals Total Emergence @ Day 44 w/Ref 8

File: d:\toxstat\1730101t.e84 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2 O	F 2 Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)		DIFFERENCE FROM CONTROL
1	Ref. Site 8	5			
$\overline{2}$	Site 3	5	0.223	46.0	0.452
3	site 4	5	0.223	46.0	0.320
4	Site 5	5	0.223	46.0	0.318
5	Site 6	5 .	0.223	46.0	0.134
6	Site 7	5	0.223	46.0	0.202
7	Site 10	5	0.223	46.0	0.236

LE: Matteo Metals Total Emergence @ Day 44 w/Ref 8 d:\toxstat\1730101t.e84
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER

GRP	IDENTIFICATION	REP	VALU	JE	TRANS V	ALUE
111112222233333444	Ref. Site 8 Ref. Site 8 Ref. Site 8 Ref. Site 8 Ref. Site 8 Site 3 Site 3 Site 3 Site 4 Site 4 Site 4 Site 5 Site 5 Site 5 Site 5 Site 6 Site 6 Site 6 Site 7 Site 7 Site 7	1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 1 2 3 3 3 4 5 1 2 3 3 4 5 1 2 3 3 4 5 3 3 3 3 4 5 1 2 3 3 4 5 2 3 3 4 5 3 3 4 5 2 3 3 4 5 2 3 3 4 5 3 2 3 3 4 5 2 3 3 3 4 5 3 4 5 1 3 3 4 5 2 3 3 3 3 3 3 4 5 3 3 3 3 3 3 3 3 3 3 3 3		.4200 .4200 .5800 .5800 .0800 .0000 .0000 .0000 .0800 .2500 .1600 .0800 .2500 .4200 .0800 .2500 .0800 .2500 .0800 .2500 .0800 .2500 .0800 .2500 .0800 .2500 .2500 .2500 .2500 .2500 .2500 .2500 .2500 .2500 .2500		7051 7051 7051 8657 8657 2868 1448 1448 1448 2868 5236 4115 2868 1448 6119 7051 1448 2868 2868 2868 7051 7854 7854 5236 6119 4115 5236 5236 7051
7 7 7 7	Site 10 Site 10 Site 10 Site 10 Site 10	1 2 3 4 5	0 0	.3300 .2500 .2500 .1600	0. 0. 0.	6119 5236 5236 4115 5236

Matteo Metals Total Emergence @ Day 51 w/Ref 8

File: d:\toxstat\1730101t.807 Transform: ARC SINE(SQUARE ROOT(Y))



SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN	
1 2 3 4 5	Ref. Site 8 Site 4 Site 5 Site 6 Site 7 Site 10	5 5 5 5 5 5	0.705 0.145 0.145 0.412 0.524 0.412	1.146 0.705 0.705 1.047 1.047 0.785	0.910 0.439 0.389 0.765 0.700 0.625	

Matteo Metals Total Emergence @ Day 51 w/Ref 8

File: d:\toxstat\1730101t.807 Transform: ARC SINE(SQUARE ROOT(Y))

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %	
1 2 5 6	Ref. Site 8 Site 4 Site 5 Site 6 Site 7 Site 10	0.033 0.041 0.050 0.078 0.042 0.020	0.183 0.204 0.223 0.279 0.204 0.140	0.082 0.091 0.100 0.125 0.091 0.062	20.11 46.37 57.21 36.48 29.21 22.34	

```
Matteo Metals Total Emergence @ Day 51 w/Ref 8

Pile: d:\toxstat\1730101t.807 Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 1.055

W = 0.960

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Emergence @ Day 51 w/Ref 8

File: d:\toxstat\1730101t.807 Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated Bl statistic = 1.82

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
le Chi-square value = 11.07 (alpha = 0.05, df = 5)
```

Data PASS Bl homogeneity test at 0.01 level. Continue analysis.

EMER. @ 51 DAYS USING REF SITE 8

Matteo Metals Total Emergence @ Day 51 w/Ref 8

e: d:\toxstat\1730101t.807 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.976	0.195	4.441
Within (Error)	24	1.055	0.044	
Total	29	2.031		

Critical F value = 2.62 (0.05,5,24)

Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Emergence @ Day 51 w/Ref 8

File: d:\toxstat\1730101t.807 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST	-	TABLE 1 OF 2	Ho:Control <treatment< th=""></treatment<>

CROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
	Ref. Site 8	0.910	0.616		
2	Site 4	0.439	0.198	3.549	*
3	Site 5	0.389	0.166	3.925	*
4	Site 6	0.765	0.482	1.095	
5	Site 7	0.700	0.416	1.583	
6	Site 10	0.625	0.348	2.147	

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

Matteo Metals Total Emergence @ Day 51 w/Ref 8

File: d:\toxstat\1730101t.807 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST		TABLE 2 (OF 2 Ho	:Control<	Treatment
GROUP	IDENTIFICAT	CION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1 2 3 4		Site 8 Site 4 Site 5 Site 6	5 5 5 5	0.307 0.307 0.307	49.9 49.9 49.9	0.418 0.450 0.134
5 ° 6.		Site 7 Site 10	5 5	0.307 0.307	49.9 49.9	0.200 0.268

Matteo Metals Total Emergence @ Day 51 w/Ref 8 d:\toxstat\1730101t.807

TRANSFORM: ARC SINE (SQUARE ROOT (Y))

NUMBER OF GROUPS: 6

		•		
GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Ref. Site 8	1	0.5000	0.7854
1	Ref. Site 8	2	0.4200	0.7051
1	Ref. Site 8	3	0.5800	0.8657
1	Ref. Site 8	4	0.7500	1.0472
1	Ref. Site 8	5	0.8300	1.1458
2	Site 4	1	0.2500	0.5236
2	Site 4	2	0.1600	0.4115
2	Site 4	3	0.1600	0.4115
2 2	Site 4	4	0.0000	0.1448
2	Site 4	4 5 1	0.4200	0.7051
2 3 3 3 3	Site 5	1	0.4200	0.7051
3	Site 5	2	0.0000	0.1448
3	Site 5	3	0.0800	0.2868
3	Site 5	4	0.0800	0.2868
	Site 5	5	0.2500	0.5236
4	Site 6	1	0.1600	0.4115
4	Site 6	√2	0.4200	0.7051
4	Site 6	3	0.7500	1.0472
4	Site 6	4.	0.7500	1.0472
	Site 6	. 2	0.3300	0.6119
5	Site 7	1	0.3300	0.6119
5 5	Site 7	2	0.2500	0.5236
5	Site 7	3	0.7500	1.0472
5 5 6	Site 7	4	0.3300	0.6119
, 5	Site 7	5	0.4200	0.7051
	Site 10	1	0.3300	0.6119
6	Site 10	2	0.5000	0.7854
6	Site 10	3	0.3300	0.6119
6	Site 10	4	0.1600	0.4115
6	Site 10	5 ,	0.4200	0.7051

Matteo Metals Total Emergence @ Day 58 w/Ref 8

e: d:\toxstat\1730101t.814 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

1 Ref. Site 8 5 0.705 1.146 0.963 2 Site 4 5 0.145 0.705 0.439
3 Site 6 5 0.612 1.284 1.019
4 Site 7 5 0.524 1.146 0.754 5 Site 10 5 0.412 0.785 0.625

Matteo Metals Total Emergence @ Day 58 w/Ref 8 File: d:\toxstat\1730101t.814 Transform Transform: ARC SINE(SQUARE ROOT(Y))

	· ·	•		•	•	
GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %	
1	Ref. Site 8	0.027	0.164	0.073	16.99	
	Site 4	0.041	0.204	0.091	46.37	
	Site 6	0.083	0.287	0.129	28.22	
4	Site 7	0.058	0.240	0.107	31.80	
5	Site 10	0.020	0.140	0.062	22.34	
			- 			

```
Matteo Metals Total Emergence @ Day 58 w/Ref 8
File: d:\toxstat\1730101t.814 Transform: ARC SINE(SQUARE ROOT(Y))

piro - Wilk's test for normality

D = 0.912

W = 0.979

Critical W (P = 0.05) (n = 25) = 0.918
Critical W (P = 0.01) (n = 25) = 0.888

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Emergence @ Day 58 w/Ref 8
File: d:\toxstat\1730101t.814 Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.35

Table Chi-square value = 13.28 (alpha = 0.01, df = 4)
Table Chi-square value = 9.49 (alpha = 0.05, df = 4)
Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
```

EMER. @ DAY 58 USING REF. SITE 8

Matteo Metals Total Emergence @ Day 58 w/Ref 8

le: d:\toxstat\1730101t.814 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

	•		T .	
SOURCE	DF	SS	MS	F
Between	4	1.146	0.286	6.285
Within (Error)	20	0.912	0.046	
Total	24	2.058		

Critical F value = 2.87 (0.05, 4, 20)Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Emergence @ Day 58 w/Ref 8

File: d:\toxstat\1730101t.814 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST	- TABLE 1 OF 2	Ho:Control <treatment< th=""></treatment<>

CROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
	Ref. Site 8	0.963	0.668		
2	Site 4	0.439	0.198	3.879	*
3	Site 6	1.019	0.700	-0.411	
4	. Site 7	0.754	0.466	1.546	
5	Site 10	0.625	0.348	2.503	*

Dunnett table value = 2.30 (1 Tailed Value, P=0.05, df=20,4)

Matteo Metals Total Emergence @ Day 58 w/Ref 8 File: d:\toxstat\1730101t.814 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2 (OF 2 Ho	::Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)		DIFFERENCE FROM CONTROL
1	Ref. Site 8	5			
2	Site 4	5	0.305	45.7	0.470
.3	Site 6	5	0.305	45.7	-0.032
4 .	Site 7	5	0.305	45.7	0.202
5	Site 10	5	0.305	45.7	0.320

Matteo Metals Total Emergence @ Day 58 w/Ref 8 d: $\t x = 1730101t.814$

TRANSFORM: ARC SINE (SQUARE ROOT (Y))

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1.	Ref. Site 8	1	0.6700	0.9589	
1	Ref. Site 8	2	0.4200	0.7051	
1	Ref. Site 8 Ref. Site 8	3	0.6700	0.9589	
1	Ref. Site 8	4	0.7500	1.0472	
1	Ref. Site 8	, 5	0.8300	1.1458	
2	Site 4	1	0.2500	0.5236	
2	_	. 2	0.1600	0.4115	
2	Site 4	3, ,	0.1600 0.0000	0.4115	
2	Site 4	4	0.0000	0.1448	
2	Site 4	5 1 2 3	0.4200	0.7051	
3 .	Site 6	1	0.3300	0.6119	
3 - 3 - 3	Site 6	2 -	0.5800	0.8657	
- 3	Site 6		0.9200	1.2840	
	Site 6	4	0.7500	1.0472	
-3	Site 6	5 1	0.9200	1.2840	
4		1 .	0.3300	0.6119	
4	Site 7	2	0.2500 0.8300	0.5236	
4	Site 7			1.1458	
4	Site 7	4 5 1	0.4200	0.7051	
	Site 7	5	0.5000	0.7854	
5	Site 10	1	0.3300	0.6119	
5 ·	Site 10	2	0.5000	0.7854	
.5 5	Site 10	3	0.3300	0.6119	
5	Site 10	•	0.1600	0.4115	
5	Site 10	5	0.4200	0.7051	

Matteo Metals Total Emergence @ Day 65 w/Ref 8

File: d:\toxstat\1730101t.821 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP II	DENTIFICATION	N	MIN	MAX	MEAN	
1	Ref. Site 8	5	0.705	1.146	0.963	
2	Site 6	5	0.785	1.426	1.100	
3. *	Site 7	5	0.524	1.146	0.754	
4	Site 10	5	0.412	0.785	0.676	

Matteo Metals Total Emergence @ Day 65 w/Ref 8
File: d:\toxstat\1730101t.821 Transform: ARC SINE(SQUARE ROOT(Y))

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
1	Ref. Site 8	0.027	0.164	0.073	16.99
2	Site 6	0.065	0.256	0.114	23.25
3	Site 7	0.058	0.240	0.107	31.80
4.	Site 10	0.027	0.166	0.074	24.53

```
Matteo Metals Total Emergence @ Day 65 w/Ref 8
File: d:\toxstat\1730101t.821 Transform: ARC SINE(SQUARE ROOT(Y))

Apiro - Wilk's test for normality

D = 0.709
W = 0.972

Critical W (P = 0.05) (n = 20) = 0.905
Critical W (P = 0.01) (n = 20) = 0.868

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Emergence @ Day 65 w/Ref 8
File: d:\toxstat\1730101t.821 Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated Bl statistic = 1.20

Table Chi-square value = 11.34 (alpha = 0.01, df = 3)
Table Chi-square value = 7.81 (alpha = 0.05, df = 3)

Data PASS Bl homogeneity test at 0.01 level. Continue analysis.
```

Matteo Metals Total Emergence @ Day 65 w/Ref 8

e: d:\toxstat\1730101t.821 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	0.563	0.188	4.239
Within (Error)	16	0.709	0.044	· · · · · · · · · · · · · · · · · · ·
Total	19	1.272		

Critical F value = 3.24 (0.05,3,16) Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Emergence @ Day 65 w/Ref 8

File: d:\toxstat\1730101t.821 Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

COUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
					
\mathbf{U}_{1}	Ref. Site 8	0.963	0.668		
2	Site 6	1.100	0.768	-1.030	
3	Site 7	0.754	0.466	1.568	
4	Site 10	0.676 :	0.398	2.157	

Dunnett table value = 2.23 (1 Tailed Value, P=0.05, df=16,3)

Matteo Metals Total Emergence @ Day 65 w/Ref 8

File: d:\toxstat\1730101t.821 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2	OF 2 Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)		DIFFERENCE FROM CONTROL
1 2 3 4	Ref. Site 8 Site 6 Site 7 Site 10	5 5 5 5	0.292 0.292 0.292	43.7 43.7 43.7	-0.100 0.202 0.270

TLE: Matteo Metals Total Emergence @ Day 65 w/Ref 8 d:\toxstat\1730101t.821
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER

1 Ref. Site 8 1 0.6700 0.9589	
1 Ref. Site 8 1 0.6700 0.9589 1 Ref. Site 8 2 0.4200 0.7051 1 Ref. Site 8 3 0.6700 0.9589 1 Ref. Site 8 4 0.7500 1.0472 1 Ref. Site 8 5 0.8300 1.1458 2 Site 6 1 0.5000 0.7854	
2 Site 6 1 0.5000 1.1458	
2 Site 6 2 0.6700 0.9589	
2 Site 6 3 0.9200 1.2840	
2 Site 6 4 0.7500 1.0472	
2 Site 6 5 1.0000 1.4260 3 Site 7 1 0.3300 0.6119	
3 Site 7 1 0.3300 0.6119	
3 Site 7 2 0.2500 0.5236	
3 Site 7 3 0.8300 1.1458	
3 Site 7 4 0.4200 0.7051	
3 Site 7 5 0.5000 0.7854	
4 Site 10 1 0.5000 0.7854	
4 Site 10 2 0.5000 0.7854	
4 Site 10 3 0.3300 0.6119	
4 Site 10 3 0.3300 0.6119 Site 10 4 0.1600 0.4115	
Site 10 5 > 0.5000 0.7854	

STATISTICAL DATA FOR Chironomus tentans

EMERGENCE USING REFERNCE STATION 9

Matteo Metals Total Emergence @ Day 44 w/Ref 9

He: d:\toxstat\1730101t.e94 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN MAX	MEAN
1	Ref. Site 9	5	0.524 0.95	9 0.736
2	Site 3	5	0.145 0.28	7 0.202
3	site 4	5	0.145 0.61	2 0.396
4	Site 5	5	0.145 0.70	5 0.389
5	Site 6	5	0.287 0.78	5 0.617
6	Site 7	5	0.412 0.70	5 0.555
7	Site 10	5	0.412 0.61	2 0.519

Matteo Metals Total Emergence @ Day 44 w/Ref 9

File: d:\toxstat\1730101t.e94 Transform: ARC SINE(SQUARE ROOT(Y))

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %	
	Ref. Site 9 Site 3	0.025 0.006	0.157 0.078	0.070 0.035	21.40 38.55	
3	site 4	0.035	0.186	0.083	46.96	
4	Site 5	0.050	0.223	0.100	57.21	
5	Site 6	0.046	0.213	0.095	. 34.58	
6	Site 7	0.012	0.110	0.049	· 19.80	
7	Site 10	0.005	0.071	0.032	13.71	

```
Matteo Metals Total Emergence @ Day 44 w/Ref 9
File: d:\toxstat\1730101t.e94 Transform: ARC SINE(SQUARE ROOT(Y))

apiro - Wilk's test for normality

D = 0.711

W = 0.987

Critical W (P = 0.05) (n = 35) = 0.934

Critical W (P = 0.01) (n = 35) = 0.910

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Emergence @ Day 44 w/Ref 9
File: d:\toxstat\1730101t.e94 Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 8.22

Table Chi-square value = 16.81 (alpha = 0.01, df = 6)
Table Chi-square value = 12.59 (alpha = 0.05, df = 6)

dta PASS B1 homogeneity test at 0.01 level. Continue analysis.
```

Matteo Metals Total Emergence @ Day 44 w/Ref 9
le: d:\toxstat\1730101t.e94 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF		SS	MS	
500KCE	Dr				
Between	6 .	•	0.919	0.153	6.031
Within (Error)	28		0.711	0.025	
Total	34		1.629		

Critical F value = 2.45 (0.05,6,28) Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Emergence @ Day 44 w/Ref 9

File: d:\toxstat\1730101t.e94 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <t< th=""><th>reatment</th><th></th></t<>	reatment	
GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
	Ref. Site 9	0.736	0.452		
2	Site 3	0.202	0.032	5.299	*
3	site 4	0.396	0.164	3.373	*
4	Site 5	0.389	0.166	3.435	*
5	Site 6	0.617	0.350	1.174	•
6	Site 7	0.555	0.282	1.791	
7	Site 10	0.519	0.248	2.151	

Dunnett table value = 2.43 (1 Tailed Value, P=0.05, df=24,6)

Matteo Metals Total Emergence @ Day 44 w/Ref 9

File: d:\toxstat\1730101t.e94 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2 OF	2 Но	:Control<	Treatment
GROUP	IDENTIFICATION		inimum Sig Diff IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Ref. Site 9 Site 3	5 5	0.228	50.5	0.420
3	site 3 site 4 Site 5	5 5	0.228	50.5	0.288
5	Site 6	5	0.228 0.228	50.5 50.5	0.286 0.102
7	Site 7 Site 10	5 5	0.228 0.228	50.5 50.5	0.170 0.204

TLE: Matteo Metals Total Emergence @ Day 44 w/Ref 9
LE: d:\toxstat\1730101t.e94
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBE

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1	Ref. Site 9	1	0.2500	0.5236	
1	Ref. Site 9	2	0.6700	0.9589	
1	Ref. Site 9	3	0.4200	0.7051	
1	Ref. Site 9	4	0.5000	0.7854	
1	Ref. Site 9	5	0.4200	0.7051	
2	Site 3	1	0.0800	0.2868	
2	Site 3	2	0.0000	0.1448	
2	Site 3	3	0.0000	0.1448	,
2	Site 3	4	0.0000	0.1448	
2	Site 3	· 5	0.0800	0.2868	
2 3	site 4	1.	0.2500	0.5236	
3	site 4	2	0.1600	0.4115	
3	site 4	3	0.0800	0.2868	
3	site 4	4	0.0000	0.1448	
3	site 4	5	0.3300	0.6119	
4	Site 5	1	0.4200	0.7051	
4	Site 5	2	0.0000	0.1448	
4	Site 5	3	0.0800	0.2868	
4	Site 5	4	0.0800	0.2868	
	Site 5	. 5	0.2500	0.5236	
5	Site 6	1	0.0800	0.2868	
5	Site 6	2	0.4200	0.7051	
5	Site 6	3	0.5000	0.7854	
5	Site 6	4	0.5000	0.7854	
5	Site 6	5	0.2500	0.5236	
6	Site 7	1	0.3300	0.6119	
6	Site 7	2	0.1600	0.4115	
6	Site 7	3	0.2500	0.5236	
6	Site 7	4	0.2500	0.5236	
6	Site 7	5	0.4200	0.7051	
7 7	Site 10	1	0.3300	0.6119	
7	Site 10	. 2	0.2500	0.5236	
	Site 10 Site 10	. 3	0.2500	0.5236	
7 7	Site 10	4 5	0.1600 0.2500	0.4115 0.5236	
, 	DICE IO	. 	0.2500	0.5236	
					

Matteo Metals Total Emergence @ Day 51 w/Ref 9

e: d:\toxstat\1730101t.907 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN		
1	Ref. Site 9	5	0.705	1.284	0.885		
2	Site 4	5	0.145	0.705	0.439		
3	Site 5	5	0.145	0.705	0.389	100	
4	Site 6	5	0.412	1.047	0.765		
5	Site 7	5	0.524	1.047	0.700	1	
6	Site 10	5	0.412	0.785	0.625	٠	

Matteo Metals Total Emergence @ Day 51 w/Ref 9

File: d:\toxstat\1730101t.907 Transform: ARC SINE(SQUARE ROOT(Y))

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
_1	Ref. Site 9	0.053	0.230	0.103	26.00
	Site 4	0.041	0.204	0.091	46.37
3	Site 5	0.050	0.223	0.100	57.21
4	Site 6	0.078	0.279	0.125	36.48
5	Site 7	0.042	0.204	0.091	29.21
6	Site 10	0.020	0.140	0.062	22.34

```
Matteo Metals Total Emergence @ Day 51 w/Ref 9
Transform: ARC SINE(SQUARE ROOT(Y))
Snapiro - Wilk's test for normality

D = 1.133
W = 0.948

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Emergence @ Day 51 w/Ref 9
File: d:\toxstat\1730101t.907 Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.71

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
ple Chi-square value = 11.07 (alpha = 0.05, df = 5)
```

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

EMEL. @ 51 DAYS USING REF. SITE 9

Matteo Metals Total Emergence @ Day 51 w/Ref 9

■le: d:\toxstat\1730101t.907 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

		•	
SOURCE	DF	SS	MS F
Between	5	0.911	0.182 3.862
Within (Error)	24	1.133	0.047
Total	29	2.044	

Critical F value = 2.62 (0.05, 5, 24)

Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Emergence @ Day 51 w/Ref 9

File: d:\toxstat\1730101t.907 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <t< th=""><th>reatment</th><th></th></t<>	reatment	
ROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Ref. Site 9		0.584		

GROUP	IDENTIFICATION	MEAN	ORIGINAL UNITS	T STAT	SIG
	Ref. Site 9	0.885	0.584		
2	Site 4	0.439	0.198	3.245	*
3	Site 5	0.389	0.166	3.608	*
4	Site 6	0.765	0.482	0.877	
5	Site 7	0.700	0.416	1.348	
6	Site 10	0.625	0.348	1.892	,

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

Matteo Metals Total Emergence @ Day 51 w/Ref 9

File: d:\toxstat\1730101t.907 Transform: ARC SINE(SQUARE ROOT(Y))

,	DUNNETT'S TEST -	TABLE 2	OF 2 Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Ref. Site 9	5			
2	Site 4 Site 5	5	0.316	54.1	0.386
4	Site 5	5. 5	0.316 0.316	54.1 54.1	0.418 0.102
5	Site 7	5	0.316	54.1	0.168
6	Site 10	5	0.316	54.1	0.236

TLE:

Matteo Metals Total Emergence @ Day 51 w/Ref 9

4년 :

d:\toxstat\1730101t.907

TRANSFORM: ARC SINE (SQUARE ROOT (Y))

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1	Ref. Site 9	1	0.4200	0.7051	
1	Ref. Site 9	2	0.9200	1.2840	
1	Ref. Site 9	3	0.5000	0.7854	
1	Ref. Site 9	4	0.5000	0.7854	
1	Ref. Site 9	. 5	0.5800	0.8657	·,
2	Site 4	1	0.2500	0.5236	
	Site 4	2	0.1600	0.4115	
2 2 2	Site 4	3	0.1600	0.4115	•
2	Site 4	4	0.000	0.1448	
2	Site 4	5	0.4200	0.7051	*
3	Site 5	1	0.4200	0.7051	
3	Site 5	2	0.000	0.1448	
3 3	Site 5	.3	0.0800	0.2868	
3	Site 5	4	0.0800	0.2868	
3	Site 5	5	0.2500	0.5236	
4	Site 6	1	0.1600	0.4115	
4	Site 6	2	0.4200	0.7051	
4	Site 6	3	0.7500	1.0472	
4	Site 6	4	0.7500	1.0472	•
	Site 6	5	0.3300	0.6119	
3	Site 7	1	0.3300	0.6119	
5	Site 7	2	0.2500	0.5236	
5	Site 7	3	0.7500	1.0472	
5	Site 7	4	0.3300	0.6119	•
5	Site 7	5 ,	0.4200	0.7051	
6	Site 10	1	0.3300	0.6119	
6	Site 10	2	0.5000	0.7854	
6	Site 10	3	0.3300	0.6119	
6	Site 10	4	0.1600	0.4115	•
6	Site 10	5 - 	0.4200	0.7051	

Matteo Metals total Emergence @58 days w/Ref 9

le: d:\toxstat\1730101.914 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN	•
1 2 3 4 5	Ref. Site 9 Site 4 Site 6 Site 7 Site 10	5 5 5 5 5	0.705 0.145 0.612 0.524 0.412	1.284 0.705 1.284 1.146 0.785	0.972 0.439 1.019 0.754 0.625	

Matteo Metals total Emergence @58 days w/Ref 9

File: d:\toxstat\1730101.914 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

1 Ref. Site 9 0.046 0.215 0.096 22.17 2 Site 4 0.041 0.204 0.091 46.37 2 Site 6 0.083 0.287 0.129 28.22 4 Site 7 0.058 0.240 0.107 31.80 5 Site 10 0.020 0.140 0.062 22.34	GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %	
	1 2 5	Site 4 Site 6 Site 7	0.041 0.083 0.058	0.204 0.287 0.240	0.091 0.129 0.107	46.37 28.22 31.80	

```
Matteo Metals total Emergence @58 days w/Ref 9
File: d:\toxstat\1730101.914 Transform: ARC SINE(SQUARE ROOT(Y))

piro - Wilk's test for normality

D = 0.990
W = 0.977

Critical W (P = 0.05) (n = 25) = 0.918
Critical W (P = 0.01) (n = 25) = 0.888

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals total Emergence @58 days w/Ref 9
File: d:\toxstat\1730101.914 Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.86

Table Chi-square value = 13.28 (alpha = 0.01, df = 4)
Table Chi-square value = 9.49 (alpha = 0.05, df = 4)
```

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

Matteo Metals total Emergence @58 days w/Ref 9

e: d:\toxstat\1730101.914 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABĻE

		·		
SOURCE	DF	SS	MS	F
Between	4	1.165	0.291	5.880
Within (Error)	20	0.990	0.050	·
Total	24	2.155	<u> </u>	

Critical F value = 2.87 (0.05,4,20) Since F > Critical F REJECT Ho: All equal

Matteo Metals total Emergence @58 days w/Ref 9

File: d:\toxstat\1730101.914 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <t< th=""><th>'reatment</th><th></th></t<>	'reatment	
CPOUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
	Ref. Site 9	0.972	0.668		
2	Site 4 Site 6	0.439 1.019	0.198 0.700	3.786 -0.330	*
4	Site 7	0.754	0.466	1.548	
. 5	Site 10	0.625	0.348	2.466	*
Dunne	tt table value = 2.30	0 (1 Tailed	Value, P=0.05, df=20,	4)	

Matteo Metals total Emergence @58 days w/Ref 9

File: d:\toxstat\1730101.914 Transform: ARC SINE(SQUARE ROOT(Y))

•	DUNNETT'S TEST -	TABLE 2 (OF 2 Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)		DIFFERENCE FROM CONTROL
1	Ref. Site 9	5			
2	Site 4	5	0.318	47.6	0.470
. 3	Site 6	5	0.318	47.6	-0.032
4	Site 7	5	0.318	47.6	0.202
5	Site 10	5	0.318	47.6	0.320

Matteo Metals total Emergence @58 days w/Ref 9 d:\toxstat\1730101.914
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBE

			` .	
GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Ref. Site 9	1	0.4200	0.7051
1	Ref. Site 9	2 ·	0.9200	1.2840
1	Ref. Site 9	3	0.6700	0.9589
1	Ref. Site 9	2 3 4	0.5800	0.8657
1	Ref. Site 9	5	0.7500	1.0472
	Site 4	1 .	0.2500	0.5236
2 2	Site 4	2	0.1600	0.4115
2	Site 4	3	0.1600	0.4115
2	Site 4	4	0.0000	0.1448
	Site 4	5 1	0.4200	0.7051
2 3 3 3 3 3	Site 6	1	0.3300	0.6119
3	Site 6	2 3	0.5800	0.8657
3	Site 6	3	0.9200	1.2840
3	Site 6	4	0.7500	1.0472
3	Site 6	5	0.9200	1.2840
4	Site 7	1	0.3300	0.6119
4	Site 7	2	0.2500	0.5236
4	Site 7	. 3	0.8300	1.1458
4	Site 7	4	0.4200	0.7051
	Site 7	4 5 1	0.5000	0.7854
	Site 10		0.3300	0.6119
5	Site 10	2	0.5000	0.7854
5 5	Site 10	2	0.3300	0.6119
5 5	Site 10	4	0.1600	0.4115
5	Site 10	5	0.4200	0.7051

Matteo Metals Total Emergence @ Day 65 w/Ref 9 Pale: d:\toxstat\1730101.921 Transform:

Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

1 Ref. Site 9 5 0.866 1.284 1.024 2 Site 6 5 0.785 1.426 1.100 3 Site 7 5 0.524 1.146 0.754 4 Site 10 5 0.412 0.785 0.676	GRP	IDENTIFICATION	N	MIN	MAX	MEAN
3 Site 7 5 0.524 1.146 0.754	1.	Ref. Site 9	5	0.866	1.284	1.024
	2	Site 6	, 5	0.785	1.426	1.100
4 Site 10 5 0.412 0.785 0.676	3	Site 7	5	0.524	1.146	0.754
	4	Site 10	5	0.412	0.785	0.676

Matteo Metals Total Emergence @ Day 65 w/Ref 9

File: d:\toxstat\1730101.921 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %	
1	Ref. Site 9	0.034	0.185	0.083	18.06	
2 -3	Site 6 Site 7	0.065 0.058	0.256 0.240	$0.114 \\ 0.107$	23.25 31.80	
	Site 10	0.027	0.166	0.074	24.53	

```
Matteo Metals Total Emergence @ Day 65 w/Ref 9
File: d:\toxstat\1730101.921 Transform: ARC SINE(SQUARE ROOT(Y))

piro - Wilk's test for normality

D = 0.739

W = 0.964

Critical W (P = 0.05) (n = 20) = 0.905
Critical W (P = 0.01) (n = 20) = 0.868

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Emergence @ Day 65 w/Ref 9
File: d:\toxstat\1730101.921 Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 0.90

Table Chi-square value = 11.34 (alpha = 0.01, df = 3)
Table Chi-square value = 7.81 (alpha = 0.05, df = 3)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
```

Matteo Metals Total Emergence @ Day 65 w/Ref 9

e: d:\toxstat\1730101.921 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	0.632	0.211	4.563
Within (Error)	16	0.739	0.046	
Total	19	1.371		

Critical F value = 3.24 (0.05,3,16) Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Emergence @ Day 65 w/Ref 9

File: d:\toxstat\1730101.921 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <t< th=""><th>reatment</th><th>•</th></t<>	reatment	•
CROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1 2 3 4	Ref. Site 9 Site 6 Site 7 Site 10	1.024 1.100 0.754 0.676	0.716 0.768 0.466 0.398	-0.561 1.984 2.562	*

Dunnett table value = 2.23 (1 Tailed Value, P=0.05, df=16,3)

Matteo Metals Total Emergence @ Day 65 w/Ref 9

File: d:\toxstat\1730101.921 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 2	OF 2 , Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)		DIFFERENCE FROM CONTROL
1 2 3 4	Ref. Site 9 Site 6 Site 7 Site 10	5 5 5 5	0.294 0.294 0.294	41.0 41.0 41.0	-0.052 0.250 0.318

Matteo Metals Total Emergence @ Day 65 w/Ref 9 d:\toxstat\1730101.921

TRANSFORM: ARC SINE (SQUARE ROOT (Y))

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Ref. Site 9	1	0.5800	0.8657
1	Ref. Site 9	2	0.9200	1.2840
I	Ref. Site 9	3	0.6700	0.9589
1	Ref. Site 9	4	0.5800	0.8657
1	Ref. Site 9	5	0.8300	1.1458
2	Site 6	1	0.5000	0.7854
2	Site 6	2	0.6700	0.9589
2	Site 6	3	0.9200	1.2840
2	Site 6	4	0.7500	1.0472
2	Site 6	5	1.0000	1.4260
3	Site 7	1	0.3300	0.6119
3	Site 7	2	0.2500	0.5236
3	Site 7	3	. 0.8300	1.1458
3	Site 7	4 5	0.4200	0.7051
3	Site 7	5	0.5000	0.7854
4	Site 10	. 1	0.5000	0.7854
4	Site 10	2	0.5000	0.7854
4	Site 10	-3	0.3300	0.6119
	Site 10	4	0.1600	0.4115
	Site 10	5	0.5000	0.7854

STATISTICAL DATA FOR Chironomus tentans TOTAL SURVIVAL WITH CONTROL & REFERENCE SEDIMENTS

Table IV: Total survival C. tentans 65 Day Emergence Test

TUDIC IV.	Otal Sulvi	vai O. lejitaris OS	Day Linergence Te	
Site ID	Total	References Significant	Sites Significant	Sites Significant
	Survival - %	. VS. Control?	VS. Site 8?	VS. Site 9?
Control	88.3	.	N/A ¹	N/A ¹
1 - Ref	25.0	YES	N/A ²	N/A ²
2 - Ref	40.0	YES	N/A ²	N/A ²
3	50.0	62.8	YES	YES
4	21,7	56.3	No	YES
5	81.7	51.7	No	No
6	81.7	48.3	No	No
7	46.7	47.4	No	YES
8 - Ref	68.3	No	<u>-</u>	N/A ²
9 - Ref	80.0	No	N/A ²	-
10 - Ref	55.0	YES	No ³	No ³

- 1 Control not included in Site analyses
- 2 References not included in Site analyses
- 3 Site 10 include as Site sample due to possible contamination

Matteo Metals Total Suvival Control vs. Reference Sites

e: d:\toxstat\173101Co.Com Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS		F
Between	5	2.037	0.407		8.328
Within (Error)	24	1.174	0.049	•	•
Total	29	3.212			

Critical F value = 2.62 (0.05,5,24)

Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Suvival Control vs. Reference Sites

DUNNETT'S TEST - TABLE 1 OF 2

File: d:\toxstat\173101Co.Com Transform: ARC SINE(SQUARE ROOT(Y))

		TRANSFORMED	MEAN CALCULATED IN		
GROUP	IDENTIFICATION	MEAN	ORIGINAL UNITS	T STAT	SIG
-1	Control	1.231	0.883		
2	Site 1	0.473	0.250	5.415	*
. 3	Site 2	0.657	0.400	4.100	*
4	Site 8	.0.989	0.683	1.732	
5	Site 9	1.116	0.800	0.820	
6	Site 10	0.836	0.550	2.822	*

Ho:Control<Treatment

Matteo Metals Total Suvival Control vs. Reference Sites
File: d:\toxstat\173101Co.Com Transform: ARC SINE(SQUARE ROOT(Y))

Dunnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

	DUNNETT'S TEST -	TABLE 2 (OF 2 Ho	:Control<	Treatment
GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Control	5			
2	Site 1	5	0.275	31.1	0.633
3	Site 2	5	0.275	31.1	0.483
4	Site 8	5	0.275	31.1	0.200
5	Site 9	. 5	0.275	31.1	0.083
6	Site 10	5 	0.275	31.1	0.333

Matteo Metals Total Suvival Control vs. Reference Sites

e: d:\toxstat\173101Co.Com Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

GRP	IDENTIFICATION	N	MIN	MAX	MEAN
1	Control	5	1.150	1.426	1.231
2	Site 1	5	0.145	0.955	0.473
3	Site 2	. 5	0.145	0.869	0.657
4	Site 8	5	0.702	1.278	0.989
- 5	Site 9	5	0.955	1.278	1.116
6	Site 10	5	0.785	0.955	0.836

Matteo Metals Total Suvival Control vs. Reference Sites

File: d:\toxstat\173101Co.Com Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
_1	Control	0.015	0.122	0.055	9.93
	Site 1	0.126	0.355	0.159	74.90
-	Site 2	0.086	0.293	0.131	44.50
4	Site 8	0.047	0.216	0.097	21.88
5	Site 9	0.015	0.122	0.054	10.89
6	Site 10	0.006	0.076	0.034	9.07

Matteo Metals Total Suvival Control vs. Reference Sites
File: d:\toxstat\173101Co.Com Transform: ARC SINE(SQUARE ROOT(Y))

Apiro - Wilk's test for normality

D = 1.174

W = 0.972

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Suvival Control vs. Reference Sites
File: d:\toxstat\173101Co.Com Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 11.18

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Fata PASS B1 homogeneity test at 0.01 level. Continue analysis.

TOTAL SURV. COMPARISON CONTROL VS. REFERENCE SITES

TLE:

Matteo Metals Total Suvival Control vs. Reference Sites

d:\toxstat\173101Co.Com

TRANSFORM: ARC SINE (SQUARE ROOT (Y))

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1	Control	1	0.8333	1.1502	
ī	Control	2	1.0000	1.4260	
1	Control		0.9166	1.2778	
1	Control	4	0.8333	1.1502	
1	Control	5	0.8333	1.1502	
2	Site 1	1	0.6666	0.9552	•
2	Site 1	2	0.1666	0.4204	
2	Site 1	,3 4	0.4166	0.7016	4
2	Site 1	4	0.0000	0.1448	
2	Site 1	5	0.0000	0.1448	
2 3	Site 2	1	0.5833	0.8691	
3 3	Site 2	2 3	0.5000	0.7854	
3	Site 2	3	0.0000	0.1448	
3	Site 2	4	0.4166	0.7016	•
3	Site 2	5 .	0.5000	0.7854	
4	Site 8	1	0.5833	0.8691	
4	Site 8	2	0.4166	0.7016	
4 .	Site 8	3	0.7500	1.0472	
4	Site 8	4	0.7500	1.0472	
	Site 8	5	0.9166	1.2778	
-5	Site 9	1	0.7500	1.0472	
5	Site 9	2	0.9166	1.2778	
5	Site 9	3	0.6666	0.9552	
5	Site 9	4	0.8333	1.1502	
5	Site 9	5	0.8333	1.1502	
6	Site 10	1	0.5000	0.7854	
6	Site 10	2	0.6666	0.9552	
6	Site 10	3	0.5833	0.8691	
6	Site 10	4	0.5000	0.7854	
6 	Site 10	5	0.5000	0.7854	

File: d:\toxstat\173101to.ts8 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

				•		
GRP	IDENTIFICATION	N	MIN	MAX	MEAN	
1 2	Reference 8 Site 3	5	0.702 0.615	1.278 0.955	0.989	
3	Site 4 Site 5	5 5	0.293 0.785	0.702 1.426	0.472 1.167	· ·
4 5	Site 6	5	0.955	1.426	1.162	
6 7	Site 7 Site 10	5 5	0.524 0.785	1.150 0.955	0.755 0.836	

Matteo Metals Total Survival Using Reference Site 8

File: d:\toxstat\173101to.ts8 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
	Reference 8	0.047	0.216	0.097	21.88
	Site 3	0.025	0.159	0.071	20.18
3	Site 4	0.023	0.152	0.068	32.29
4	Site 5	0.074	0.271	0.121	23.25
5	Site 6	0.060	0.244	0.109	20.99
6	Site 7	0.058	0.241	0.108	31.96
7	Site 10	0.006	0.076	0.034	· 9.07
			. 		

```
Matteo Metals Total Survival Using Reference Site 8
Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 1.169
W = 0.966
Critical W (P = 0.05) (n = 35) = 0.934
Critical W (P = 0.01) (n = 35) = 0.910

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Survival Using Reference Site 8
File: d:\toxstat\173101to.ts8
Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 6.24

Table Chi-square value = 16.81 (alpha = 0.01, df = 6)
Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
```

TOTAL SURVIVAL USING REF. SITE 8

Matteo Metals Total Survival Using Reference Site 8 ANOVA TABLE 7.317 1.833 0.306 Between 0.042 1.169 Within (Error) 28 Critical F value = 2.45 (0.05,6,28) Since F > Critical F REJECT | Ho: All equal Matteo Metals Total Survival Using Reference Site 8 File: d:\toxstat\173101to.ts8 Transform: ARC SINE(SQUARE ROOT(Y)) DUNNETT'S TEST - TABLE 1 OF 2 Ho:Contro Ho:Control<Treatment TRANSFORMED MEAN CALCULATED IN ORIGINAL UNITS GROUP IDENTIFICATION 0.989 0.786 0.472 1.167 Reference 8 0.683 1.569 Site 3 0.500 Site 4 3.999 0.217 Site 5 Site 6 Site 7 0.817 0.817 -1.380 1.162 0.755 -1.341 0.467 Site 10 0.836 0.550 1.180 Dunnett table value = 2.43 (1 Tailed Value, P=0.05, df=24,6) Matteo Metals Total Survival Using Reference Site 8 File: d:\toxstat\173101to.ts8 Transform: ARC SINE(SQUARE ROOT(Y)) DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM REPS		nimum Sig Dif N ORIG. UNITS		DIFFERENCE FROM CONTROL
1 2 3 4 5 6 7	Reference Site Site Site Site Site	3 5 4 5 5 5 6 5 7 5		0.308 0.308 0.308 0.308 0.308 0.308	45.0 45.0 45.0 45.0 45.0 45.0	0.183 0.467 -0.133 -0.133 0.217 0.133
			T .	No. of the control of		

d:\toxstat\173101to.ts8 TRANSFORM: ARC SINE (SQUARE ROOT (Y))

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1	Reference 8	1	0.5833	0.8691	
1	Reference 8	2	0.4166	0.7016	
ī	Reference 8	3	0.7500	1.0472	
1	Reference 8	4	0.7500	1.0472	
1	Reference 8		0.9166	1.2778	
2	Site 3	5 1	0.4166	0.7016	•
2	Site 3	2	0.6666	0.9552	
2	Site 3	3	0.6666	0.9552	
2	Site 3	4	0.4166	0.7016	•
2	Site 3	5	0.3333	0.6154	
3 3 3	Site 4	1	0.2500	0.5236	
3	Site 4	2	0.1666	0.4204	
3	Site 4	3	0.1666	0.4204	
3	Site 4	4	0.0833	0.2928	
3	Site 4	5	0.4166	0.7016	
4	Site 5	1	1.0000	1.4260	
4	Site 5	2	0.8333	1.1502	
4	Site 5	3 .	0.7500	1.0472	
4	Site 5	4	1.0000	1.4260	
	Site 5	5	0.5000	0.7854	
3	Site 6	1	0.6666	0.9552	•
5	Site 6	`2	0.6666	0.9552	
5	Site 6	3	1.0000	1.4260	
5	Site 6	4	0.7500	1.0472	
5	Site 6	5	1.0000	1.4260	
6	Site 7	1	0.3330	0.6151	
6	Site 7	2	0.2500	0.5236	
6	Site 7	3	0.8333	1.1502	•
6	Site 7	4	0.4166	0.7016	
6	Site 7	5	0.5000	0.7854	
7	Site 10	1	0.5000	0.7854	' ‡
7	Site 10	2	0.6666	0.9552	
7	Site 10	3	0.5833	0.8691	
7	Site 10	4	0.5000	0.7854	
7	Site 10	5	0.5000	0.7854	

le: d:\toxstat\173101to.ts9 Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 1 of 2

			1		
GRP	IDENTIFICATION	И	мій	MAX	MEAN
1	Reference 9	5	0.955	1.278	1.116
2	Site 3	5	0.615	0.955	0.786
3	Site 4	5	0.293	0.702	0.472
4	Site 5	5	0.785	1.426	1.167
5	Site 6	5	0.955	1.426	1.162
6	Site 7	5	0.524	1.150	0.755
7	Site 10	5	0.785	0.955	0.836

Matteo Metals Total Survival Using Reference Site 9 File: d:\toxstat\173101to.ts9 | Transform: ARC Transform: ARC SINE(SQUARE ROOT(Y))

SUMMARY STATISTICS ON TRANSFORMED DATA TABLE 2 of 2

GRP	IDENTIFICATION	VARIANCE	SD	SEM	C.V. %
	Reference 9	0.015	0.122	0.054	10.89
	Site 3	0.025	0.159	0.071	20.18
3	Site 4	0.023	0.152	0.068	32.29
4	Site 5	0.074	0.271	0.121	23.25
5	Site 6	0.060	0.244	0.109	20.99
6	Site 7	0.058	0.241	0.108	31.96
7	Site 10	0.006	0.076	0.034	9.07

```
Matteo Metals Total Survival Using Reference Site 9
Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 1.041

W = 0.965

Critical W (P = 0.05) (n = 35) = 0.934
Critical W (P = 0.01) (n = 35) = 0.910

Data PASS normality test at P=0.01 level. Continue analysis.

Matteo Metals Total Survival Using Reference Site 9
File: d:\toxstat\173101to.ts9

Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 7.48

Table Chi-square value = 16.81 (alpha = 0.01, df = 6) (alpha = 0.05, df = 6)
Data PASS B1 homogeneity test at 0.01 level. Continue analysis.
```

le: d:\toxstat\173101to.ts9 Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6 .	2.040	0.340	9.146
Within (Error)	28	1.041	0.037	
Total	34	3.081		

Critical F value = 2.45 (0.05,6,28) Since F > Critical F REJECT Ho: All equal

Matteo Metals Total Survival Using Reference Site 9

File: d:\toxstat\173101to.ts9 Transform: ARC SINE(SQUARE ROOT(Y))

	DUNNETT'S TEST -	TABLE 1 OF 2	Ho:Control <t< th=""><th>reatment</th><th></th></t<>	reatment	
GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
	Reference 9	1.116	0.800		
2 .	Site 3	0.786	0.500	2.709	*
3	Site 4	0.472	0.217	5.284	*
4	Site 5	1.167	0.817	-0.417	
5	Site 6	1.162	0.817	-0.375	
6	Site 7	0.755	0.467	2.960	*
, 7	Site 10	0.836	0.550	2.296	

Dunnett table value = 2.43 (1 Tailed Value, P=0.05, df=24,6)

Matteo Metals Total Survival Using Reference Site 9

File: d:\toxstat\173101to.ts9 Transform: ARC SINE(SQUARE ROOT(Y))

TIFICATION Reference 9	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)		DIFFERENCE FROM CONTROL
Peference 9				
Site 3 Site 4 Site 5 Site 6 Site 7	5 5 5 5 5	0.273 0.273 0.273 0.273 0.273	34.1 34.1 34.1 34.1	0.300 0.583 -0.017 -0.017 0.333 0.250
	Site 3 Site 4 Site 5 Site 6	Site 3 5 Site 4 5 Site 5 5 Site 6 5 Site 7 5	Site 3 5 0.273 Site 4 5 0.273 Site 5 5 0.273 Site 6 5 0.273 Site 7 5 0.273	Site 3 5 0.273 34.1 Site 4 5 0.273 34.1 Site 5 5 0.273 34.1 Site 6 5 0.273 34.1 Site 7 5 0.273 34.1

E: d:\toxstat\173101to.ts9
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 7

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE	
1	Reference 9	1	0.7500	1.0472	
1	Reference 9	2	0.9166	1.2778	
1 .	Reference 9	3	0.6666	0.9552	
1.	Reference 9	4	0.8333	1.1502	
1	Reference 9	5	0.8333	1.1502	
2	Site 3	1	0.4166	0.7016	
2	Site 3	2	0.6666	0.9552	
2	Site 3	3	0.6666	0.9552	
2	Site 3	4	0.4166	0.7016	•
2	Site 3	5	0.3333	0.6154	
3	Site 4	1	0.2500	0.5236	
3	Site 4	2	0.1666	0.4204	
3	Site 4	3	0.1666	0,.420,4	
3	Site 4	4	0.0833	0.2928	
3	Site 4	5	0.4166	0.7016	
4	Site 5	1	1.0000	1.4260	
4	Site 5	2	0.8333	1.1502	
4	Site 5	3	0.7500	1.0472	
4	Site 5	4	1.0000	1.4260	*
	Site 5	5	0.5000	0.7854	
	Site 6	1	0.6666	0.9552	
5	Site 6	2	0.6666	0.9552	
5	Site 6	3	1.0000	1.4260	
5	Site 6	4	0.7500	1.0472	
5	Site 6	5	1.0000	1.4260	
6	Site 7	1	0.3330	0.6151	
6	Site 7	2	0.2500	0.5236	
6	Site 7	3	0.8333	1.1502	•
6`	Site 7	4	0.4166	0.7016	
6	Site 7	5	0.5000	0.7854	
7	Site 10	1	0.5000	0.7854	
7	Site 10	'. 2. '3	0.6666	0.9552	
7 7	Site 10 Site 10		0.5833	0.8691	
7	Site 10 Site 10	4 5	0.5000 0.5000	0.7854 0.7854	
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CHAIN OF CUSTODY DOCUMENTATION



STL EDISON



CHAIN OF CUSTODY RECORD

Report to:	Invoice to:	ANALYSIS		Lab Use Only
Company: Louis Berger Groups	Company. Louis Berge Coras	REQUESTE	1 1 1 1 1	Due Date:
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Contact Tom Tanico	Contact Ton Tunico		IIIIII	1 2 7 3 4 5
Phone: 973-678-1960 1608	Phone: 7.71-678-1960 x 64	3	/•./	Custody Seal N /,Y
Fax 572-676-3564	Fax 973-676-3564	_] ./		fitacl N/Y
Contract/			N +	Screened For Radioactivity
Quole:		_ / /;	X J	
Sampler's Name Brian Jankauskas	Sampler's Signature	\int_{c}^{R}		JOB: N101
Prol. No. Project Name	No/Time of Contra			1 1 20 - 11 1
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			terms and conflicts contained	
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Severn Trent Laboratories, Inc. 208 South Park Drive, Suite 1, Colchester, VT 05446 Tel: (802) 655-1203



CHAIN OF CUSTO RECORD

Report to:	Invoice t	to:	Analysis	7 7 7		Lab Use Only Due Date: Temp. of coolers
Company: Cours Berger Group	Company: Levis Berge	- 600 D	REQUESTED	/ / / /		/ / Due Date.
Address: 30 Vreeland Rat Blog A	Company: Levis Bugo Address: So Vreelan	S Pund Blun A		/ / / /	-	Temp. of coolers
Floham Pork, NY 07932	Florham Pa	erk, US 02932	. , <i>f</i>			when received (C°):
Contact: Tom Tanico	Contact: To- Tuni	(D)	· /.;	\mathcal{H}		1 2 3 4 6
Phone: 723-678-1960 x 608	Phone: 523-628-		. \ 6		!	Custody Seal N / Y
Fax: 977-676 - 356 Y	Fax: 973-676-		(0)	ik		Intact N/Y
Contract/			/ N	/ / / /		Screened For Radioactivity
Quote:			17	v/ / ./		For Nauloactivity (,,)
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Brian Jankanskas	Sampler's signature	lark	耳到心	ĭ/		JOB: NO49
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Severn Trent Laboratories, Inc. .. 208 South Park Drive, Suite 1, Colchester, VT 05446 Tel: (802) 655-1203

CHAIN OF CUSTODY RECORD

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Phone: 973-678-(960x 608	Phone: <u>973-678-</u>		ľ		[], [/ / /			/	Intact N/Y
Fax: 978 - 676 - 3564	Fax: 973-676	<u>- 222-</u>		/	-		- -		/	Screened
Contract/				/			//	/ /	/	For Radioactivity
Quote:				. /]. [1:1	/ 1	
Sampler's Name	Sampler's Signature	<i>/</i> / .		47	/· / -		/ /		/	
Brian Tan kan kas	Jan Sal			- 9	/ / /	/ / /	′ / .	/ :	/	
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Final Aquatic Biota Study Report - Matteo Iron and Metals, West Deptford, NJ
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Appendix D

Fish field data sheets

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	節動機	Station	在發展	3	西	Replicat	B 1	2	問題語言	Date	8/28	Sa	mple Ti	me	8:59		Time of	Low Ti	de	9:39
	Fundul		Fundul																	
Species	diapha	nus	heteroc	litus	7.	7										1			1	
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Total Caught Tissue Sample	y	es	n	0				1,000		1 2 5	7 214									
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	26		36		N. T.															
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	55250A	Station	品語為兩個	3	DESCRIPTION OF THE PERSON OF T	Replicat	е	3	2.63%	Date	8/28	Sa	mple Ti	me	9:05	四洲沙野	Time of	Low Ti	de	9:39
Species	Fundui	lus	Fundul	us		V 1				7 9										
Total Caught	Grapma	9	neteroe					300			7.00				15			36.14		10.5
Tissue Sample		es	n														41-1949		-	
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	34 35	1	44 45				100						5.84					100		
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	37 38	3	47 48																	
	39 40	1	49 50						1000	THE REAL PROPERTY.			E P			N. T.				
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	43		53	3.9																
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	46		56 57					152			-		- 1					100		
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			65 66	1		-	7, 17										3			
:			67		4.4		310)							J.E.						
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		2.85	72 73					High			- 7							389		
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	No.	Station		4	Contract P	Replicat	е	1	言語解語	Date	8/28	Sa	mple Ti	me	10:50		Time o	Low Ti	de	9:39
	Fundul	lue	Fundul	110	Lepomi	ie	Alosa													
Species	diapha	nus	heteroo		gibbosi	IS	pseudo	hareng	us										1.58	
Total Caught		79		53		2		1			1982			A 150	1			1		
Tissue Sample		es	n	10	ye	es		10												100
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	36		46		96		46					THE DESIGNATION OF THE PERSON			1000					
	37	Lin 2	47	1	97		47	1				110-72							1	
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	2,350,40	Station	经常的	4	自然的是F	Replicat	e	3	2000年	Date	8/28	Sa	mple Ti	me	11:00	條節號	Time o	Low Ti	de	9:39
	E		Ford de																	
Species	Fundul diapha		Fundulu heteroc		Lepomi	5														
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ue Sample	ye		n			-1		100					N. C.						1100	
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Final Aquatic Biota	Study Report - Matteo	Iron and Metals,	West Deptford, NJ
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Appendix E

Statistical summary of fish catch in the study area

Statistical summary of fish catch in the study area

Station		1			2			3			4			5			6			7			8			9			10		On-site	Reference	Total	
Replicate	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	Stations	Stations	Individuals	
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Fundulus heteroclitus	5	2	1	3	2	1	3	2	7	253	112	343	124	82	18	12	5	9	7	5	4		1	1	1	5	9		1	3	970	51	1021	Fundulus heteroclitus
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Morone saxatilis	_					-	-	_	-	_			_	_	_	├	-	_	-	-		_	2		-			<u> </u>	-	-		4	4	Trinectes maculatus
Trinectes maculatus	1 Sparrer author	DECEMBER 1998	1989/1988	PERSONAL PROME					SA HARRISTONIA T				55.005.006.00	B. W. S. S. W. S.				2883758852	Ride State State	1		2										4	1	Timectes macdiatas
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Total Abundance	_		4	5		5	-	9.00	10	333	341.00	430	150	97.33	20	- 50	25.33	01	10	15.67	10	100	160.33		100	156.33		-	47.67	_				
Station Mean	-	8.00		_	4.00					_		`	-	4105.33		-	206.33		-	6.33		_	10760.3		_	489.33			534.33					
Variance		12.00	200 DOSSWA		3.00			39.00		45 NO 275	23131.00			4105.33			200.33			0.55			10700.5			409.00			004.00					
Total Species	. 3	3	2	3	Ι 1	T 3	2	2	2	4	4	3	2	2	3	2	2	2	4	T 4	5	9	10	6	6	8	6	6	6	6				
Station Mean	-	2.7			2.3		-	2.0			3.7		-	2.3			2.0		1	4.3			8.3			6.7			6.0		4	12	12	MeanTaxa/Species
Variance	-	0.33		 	1.33		+-	0.00		_	0.33		_	0.33			0.00			0.33			4.33		1	1.33			0.00					
variance		0.33			1.00			0.00	X Z		0.55			0.00			0.00																	
Diversity (H')	0.410	10349	0.244	0.413	Ι ο οοο	0.413	0.207	0.301	0.208	0.261	0.319	0.285	0.200	0.263	0.318	0.276	0.298	0.262	0.450	0.486	0.594	0.451	0.298	0.419	0.419	0.239	0.261	0.528	0.620	0.609				
Station Mean		0.348		0.413	0.000		0.297	0.298		0.201	0.288	0.200	0.200	0.260		0.2.70	0.279	0.232	1	0.510	0.004		0.390		1	0.306			0.586		0.287	0.473	0.492	Mean Diverstiy
Station Wear	<u>'</u>	0.334			0.275	_		0.290			0.200			0.200			U.L.I U		Name of Street	2.010	-	_	-		_	-						-		

Final Aquatic Biota Study	Report - Matteo Ir	on and Metals,	West Deptford, NJ
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Appendix F

Benthic macroinvertebrate data sheets

Statistical summary of benthic macroinvertebrates collected in the study area

	Station		1			2			3			4			5			6			7		8			9			10		On-site	Reference	Total	
Species/Taxa Coll	lected Replicate	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2 3	1	2	3	1	2	3	1	2	3	stations	stations	Individuals	
				15.00																					加维						(3,4,5,6)	(1,2,7,8,9,10)	All Stations	
OCHAETA					1																													Species/Tax
	Oligochaeta A	2		6	112	24	23	149	12	11	1	13	1	88	6	32	8	27	33 1	14	21 3	6	8	5	16	18	14	3	9	6	381	290	671	Oligochaeta A
	Oligochaeta B													8	5	6	1		2	1	3	1	2	1							22	8	30	Oligochaeta B
CTA																																		
Odonata																						\top												1
	Gomphidae (naiad)	1																														1	1	Gomphidae
Diptera																																		
	Chironomidae (larva/pupa)	17	14	10	49	17	4	24	5	9	6	5	2	22	17	7	24	19	42	7	7 1	5	7	7	2			2	9	8	182	166	348	Chironomidae
STACEA																																		
Isopoda																																		
	Anthuridae				1																								3	1		5	5	Anthuridae
Amphipoda																																		
	Gammaridae		6	1																		1										8	8	Gammaridae
LVIA																																		
Veneroida																																		
	Corbiculidae																																	
	Corbicula fluminea	20	21	9	9	11	1	9	2	1	1			9	1	1			2		1	1	3	1	1	1	2	1	5		26	87	113	Corbicula fluminea
Paleoheterodonta																																		
	Unionidae	1	1	2	1		1																									6	6	Unionidae
IDINEA		2				1	2	1	2					1																	4	5	9	Hirudinea
																					1267													
	Total Abundance	43	42	28	172	53	31	183	21	21	8	18	3	128	29	46	33	46	79 2	22	32 4	14	20	14	19	19	16	6	26	15	615	576	1191	Total Abundance
	Station Mean		37.67			85.33			75.00			9.67			67.67			52.67			9.33		16.00			18.00			15.67					
	Variance		70.33			5754.3	13		8748.00)		58.33		2	802.33		()	62.33		20	01.33		12.00)		3.00			100.33		Alleridate			
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	Total Taxa/species	6	4	5	5	5	6	5	4	3	3	2	2	5	4	4	3	2	4		4 2	5	4		3	2	2	3	4	3				
	Station Mean		5.0			5.3	1		4.0			2.3			4.3			3.0			3.0		4.3			2.3			3.3		6	10	10	MeanTaxa/Species
	Variance		1.00			0.33			1.00			0.33			0.33			1.00		1	1.00		0.33			0.33			0.33					
	经产业 的企业。													100													位。							
	Diversity (H')	0.51	0.47	0.60	0.37	0.49	0.38	0.27	0.48	0.37	0.32	0.26	0.28	0.42	0.46	0.39	0.30	0.29	0.39 0	.34 (0.41 0.3	24 0.5	6 0.54	0.47	0.23	0.09	0.16	0.44	0.56	0.38				
	Station Mean		0.53			0.41			0.37			0.28			0.42			0.33		(0.33		0.53			0.16			0.46		0.4207172	0.521411046	0.45652758	Mean Diversity

Station # -	Replica	ate # -	Substrate Ty Sandy	oe -
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ID By - T, Stewart SPECIES		COUNT	TOTAL#	MOTES.
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SPECIES		COUNT	TOTAL#	NOTES
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unknown Dipteran I	arvae			
Hirudinea				
Corbicula flumir	100	WH IM S		
Juvenile Bryanvic	-, !			

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ID By - T. Stewart SPECIES	Time C	collected - 0810	QC by -	QC date -
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ID By - T. Stewart	Time C	Collected -	QC by -	QC date -
SPECIES		COUNT		NOTES
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Chironomidae	· · · · ·	TUR WIN W	12	
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Juvenile Bivali	/IQ			
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SPECIES)UNT:	QC by -	NOTES	
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Chironomidae		MI 11	ļ	
				
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ID By - T. Stewart 1 SPECIES	ime C	collected -	QC by -		
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ID By - T. Stewart	Time C	ollected - 0935	QC by -	QC-date -
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ID By - T. Shinsker SPECIES			TOTAL#	NOTES
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	Appendix G		
Statistical summary of	Appendix G benthic macroinvertebrates	collected in the study area	
Statistical summary of		collected in the study area	
Statistical summary of		collected in the study area	
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Statistical summary of		collected in the study area	
Statistical summary of	benthic macroinvertebrates		
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Statistical summary of	benthic macroinvertebrates		

The Louis Berger Group, Inc.

Final Aquatic Biota Study Report - Matteo Iron and Metals, West Deptford, NJ

Appendix H

NJDEP diagnostic consultation report - Fundulus heteroclitus

ACC. NO. 31-IA

NEW JERSEY DIVISION OF FISH AND WILDLIFE OFFICE OF FISH AND WILDLIFE HEALTH AND FORENSICS DIAGNOSTIC CONSULTATION REPORT



SITE	Hessian Run	LOCATION Matteo Site	LATITUDE - LONGITUDE
DIAGNOSIS	Trematode metacercariae		DATE 03-Sep-03
	by Edmund W	/ashuta, Principal Biologist (Fish Pathology)	55 SEP 55

Fish from the Matteo site were examined at the request of Nancy Hamill, Ecological Risk Assessor in the Bureau of Environmental Evaluation and Risk Assessment, DEP. The site is under jurisdiction of the Site Remediation Program (SRP), Bureau of Case Management; Case Manager is Larry Quinn.

Fish were collected and submitted for examination under the direction of Rich Harding (973-678-1960 x 451). Collectors observed unusual swimming behavior, exophthalmos, and skin lesions on mummichogs and to a lesser extent on banded killifish (Fundulus diaphanus). Only mummichogs (Fundulus heteroclitus) were submitted for examination.

Site History (provided by Nancy Hamill):

Matteo Iron & Metal Site, 1708 US Highway 130, West Deptford, Gloucester County

The Matteo Iron & Metal Site is 80 acres in size, with the majority of the site unpaved and heavily wooded, with a slight slope toward the west/northwest direction of the Hessian Run and Woodbury Creek. These creeks are associated with extensive freshwater tidal marshes that are regularly flooded by daily tides. The site operated as an unregistered landfill, junkyard, and metal recycling facility between 1961 and 1968. A "sweating fire box" was used to melt lead battery terminals for lead reclamation until 1985. In 1972, NJDEP first observed landfilling of crushed battery casings in an area of wetlands adjacent to the Hessian Run and drums of hazardous waste throughout the property. Lead up to 20,000 mg/kg has been detected in sediments adjacent to the site; surface water concetrations of lead exceed the NJ surface Water Quality Standards. Currently, Matteo operates a recycling and junkyard operation.

As a frame of reference, SRP uses a sediment screening criterion for lead of 31 mg/kg; above this, there is potential for adverse ecological effects, and further investigation is needed. Sediment concentrations at Matteo ranged from around 100 - over 1000mg/kg.

Lesions observed on the fish examined from the Matteo site were the result of infection with unidentified trematode metacercaria. Other parasites found (Phagicola diminuta and Eustrongylides larvae) did not induce any gross pathology. Some of the lesions observed at necropsy may have been the result of handling during collection and transport. Bacteriologic examination revealed a systemic bacterial infection with Aeromonas hydrophila in one of nine fish examined and was not considered to be responsible for the external lesions observed. Neither exophthalmos nor erratic swimming behavior was seen in any of the fish examined.

31-IA

NEW JERSEY DIVISION OF FISH AND WILDLIFE OFFICE OF FISH AND WILDLIFE HEALTH AND FORENSICS DIAGNOSTIC CONSULTATION REPORT



Fundulus heteroclitus	001		2.5"	3.2 g	Gross - Red, inflammed area on operculum on right side, left normal in appearance.
					Wet micro - Trematode metacercariae in scrapings from opercular lesion; spinedbody, OS and VS unarmed; encysted trematode metacercaria abundant in gills, identified as Phagicola diminuta Bacteriology - TSA slant from kidney - no growth at 72 hrs
	002		2.9"	5.2 g	Gross -Pink lesion in opercular region between operculum and preoperculum; pale area with some scale loss on left side of body. Wet micro - Trematode metacercariae in scrapings from operculum (as described above); moderately heavy infection of gills with Phagicola diminuta metacercariae; single Eustrongylides in body cavity Bacteriology - TSA slant from kidney - no growth at 72 hrs
Fundulus heteroclitus	003		3.3"	6.1 g	Gross - Pink raised area on operculum Wet micro - trematode metacercariae associated with opercular lesion; moderately heavy infection of gills with Phagicola diminuta metacercariae. Bacteriology - TSA slant from kidney - no growth at 72 hrs
Fundulus heteroclitus	004		3,1"	7.8 g	Gross - Pale, rough areas of scale loss on back; red lesion on operculum Wet micro - No siginficant amount of bacteria or fungi present in smears from pale areas on skin; trematode metacercaria present in red opercular lesion (oval. spined cuticle, aspinous OS); liver pale; heavy infection of gills with Phagicola diminuta metacercariae. Bacteriology - TSA slant from kidney - growth in 24 hrs at 25C - oxidase positive, gram negative, TSI A/A, identified as Aeromonas hydrophila
Fundulus heteroclitus	005		2.5"	4.3 g	Gross - pale lesions on skin Wet micro -no parasitic, bacterial or fungal involvement in skin lesions; Phagicola diminuta cysts presnet in gill filaments; single Eustrongylides coiled in body cavity Bacteriology - TSA slant from kidney - no growth at 72 hrs
Fundulus heteroclitus	006		2.7"	3.7 g	Gross - pale lesions on skin Wet micro -no parasitic, bacterial or fungal involvement in skin lesions; numerous Phagicola diminuta cysts present in gill filaments; single Eustrongylides coiled in body cavity Bacteriology - TSA slant from kidney - no growth at 72 hrs
Fundulus heteroclitus	007		2.7"	4.8g	Gross - pink area on operculum / preoperculum Wet micro - trematode metacercaria in scrapings from opercular lesion; Phagicola diminuta metacercaria in gills; single Eustrongylides in body cavity Bacteriology - TSA slant from kidney - no growth at 72 hrs
Fundulus heteroclitus	008		2.3"	2.1 g	Gross - pink area on opercle Wet micro - trematode metacercariae in scrapings from opercular lesion; Phagicola diminuta in gills Bacteriology -TSAslant from kidney - no growth at 72 hrs
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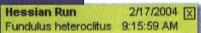
ACC. NO.

31-IA

NEW JERSEY DIVISION OF FISH AND WILDLIFE OFFICE OF FISH AND WILDLIFE HEALTH AND FORENSICS DIAGNOSTIC CONSULTATION REPORT



DATE	Species	RefNo	SEX	AGE	LENGTH	WEIGHT	NECROPSY
04-Sep-03	Fundulus heteroclitus	009			2.6"		Gross - pink area between operculum and preoperculum Wet micro - trematode metacercariae in scrapings from opercular lesion; Phagicola diminuta in gill cysts Bacteriology -TSAslant from kidney - no growth at 72 hrs



heteroclitus) collected on 3 September 2003 from Hessian Run, a tributary to Woodbury Creek, were delivered to the Hackettstown SFH lab by Rich Harding.

Collectors had observed unusual swimming behavior, exophthalmos, and skin lesions on mummichogs and to a lesser extent on banded killifish (Fundulus diaphanus).

Necrospy of nine live specimens was performed at the Pequest SFH laboratory on 4 September 2003.



